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NHILL FARM COMPETITIONS, 1918.

Report by the Judge, Mr. H. A. Mullett, B. Ag.Sc., Science Field Officer.

General Impressions.

After devoting a crowded week to the inspection of numerous wheat crops and fallows, and after an analysis of the farming methods of the community, one leaves the Nhill district impressed with the skill of those farmers whose yields for the past five years (including one of drought) have averaged between eight and nine bags to the acre. That impression is all the more firmly established by the inspection of several crops this year that will yield nearer 40 bushels to the acre than the figure already mentioned—and this on a rainfall of 14 inches, *i.e.*, 2 inches under the average.

Inquiry shows that these results cannot be wholly ascribed to any one cause, but rather, are the cumulative effect of the faithful carrying out of a number of important details. Not only has careful attention been given to each of the scientific factors that are essential to success, viz., preparation and maintenance of the fallow, attention to manuring, the use of improved seed-wheat, a systematic rotation of crops, including oats, and also the keeping of sheep, but, in addition, marked energy, determination, and judgment has been displayed in executing each of the farming operations in the right way, at the right time. The successful men are thus those who, in addition to being possessed of sound agricultural knowledge, are not content to drift along with current weather conditions, but have adopted a robust fighting policy of "bending" the seasons to *their* will.

Methods of Increasing Carrying Capacity Specially Important at Present.

Among the economic changes caused by the war, none has given the primary producer more concern than those adjustments necessary in the regular farming systems as a result of the relatively greater increase in the value of sheep products as compared with those of the cereals. Professor Perkins, writing in the *Journal of Agriculture* of South Australia recently, showed that while wheat has increased 25 per cent in price and costs 9d. per bushel extra to produce now, as compared with a ten year pre-war period, wool has increased 61 per cent. in value, without a corresponding increase in the cost of production. The popular adjustment is to reduce the area cultivated; but many farmers, in order to utilize their horses, which are not saleable at present, except at a heavy loss, have been obliged to continue their usual cropping. It is certain that while the present conditions continue, methods of increasing the carrying capacity of a farm are of more than passing interest to primary producers, especially those who are forced by existing circumstances to maintain their holdings under cultivation.

As a result of my recent and previous visits to the Wimmera, I am strongly imbued with the idea that this improvement is feasible, and may be effected by putting to better use that part of the farm now allowed to take care of itself. Two ways suggest themselves—one is the improvement of the present pasture by the sowing of a temporary pasture suited to the conditions brought about by the preceding cereal crop; the other is that greater use might be made of oats, barley, or another plant as a catch crop for early feed.

If there is another impression, it comes from viewing the successful efforts of several advanced agriculturists in what are usually termed the side-lines. The methods and results of these men prove at fault the general conception of the Wimmera as a one-crop, one-stock country.

The District.

For the information of those outside the district, who may be unfamiliar with the Wimmera, undoubtedly one of the most fertile wheat provinces in Australia, it should be stated that Nhill is situated at a distance of about 30 miles from the South Australian border, on the main railway line connecting Melbourne with Adelaide. From the most northerly part of those broad fertile black plains, which stretch easterly from Murtoa, Horsham, Natimuk, Dimboola, in the general direction of Rupanyup, Minyip, and Warracknabeal, a narrow irregular tongue of the same class of soil, with Nhill at its centre, extends westerly toward the border. To the north and south of this tongue, which is never more than 25 miles wide, and is often but a few miles across, lies a sandy desert area covered with stunted mallee. Between the fertile area and the desert country is what is known as fringe country, where the box and bull-oak trees of the black soils intermingle with the mallee scrub. The light, friable black loams of the fringe gradually change to a red or grey sandy loam wholly covered with mallee. Both these soils grow excellent crops of wheat.

The contour of the whole country is, in general, undulating; the rising ground is often of a red clayey nature, somewhat deficient in lime as compared with the black soils, and rather difficult to work, except where it contains a high proportion of sand; but the majority of the land comprises extensive areas of rich black soil. It is friable and possesses a characteristic quality of being workable almost at any time of the year. Occasional swamps are met with.

The rainfall at Nhill averages 16.59 inches. The stock carrying capacity of the land in the district is about two sheep to three acres.

The area was originally thrown open for selection in 320 acre lots, but to-day farms of this size are rarely seen: The areas range from 640 acres to several thousands of acres. The average size of ten farms inspected was close on 1,500 acres.

The Farming Methods—General Rotation Practised.

With the type of farming as practised at present it is general to regard wheat (after fallow) as the cash crop. The sowing of a portion

A Wimmera Farmstead.

of the wheat stubbles to oats, partly for horse feed and partly as a general policy to grow an occasional crop of this cereal after wheat as a preventative of wheat diseases such as flag-smut and take-all, is routine practice. The rest of the farm, usually the largest portion, comprises paddocks resting after one or other of the above cereal crops. This becomes clothed with self-sown native grasses such as wallaby grass, trefoil, and with wild oats. It is possible to maintain up to a sheep to the acre on these paddocks, the feed being supplemented, of course, by wheat stubbles, and often, should the condition of the cereal crop warrant it, by the feeding off of this crop too.

On a typical 640-acre farm at Nhill, probably 250 acres would be annually sown to wheat and oats, a common proportion being 180 of wheat to 70 of oats. There would also be 180 acres of fallow, and on the rest, 210 acres, about 200 sheep would be maintained. On a farm

of larger size, say, of 2,240 acres, *i.e.*, an aggregation of seven of the original blocks, a fairly typical instance of the cropping system followed is each year to sow about 470 acres of cereals, of which, say, 320 would be wheat, and 150 oats, while 320 acres would be fallowed. On the rest, supplemented by the stubbles, &c., but without any special effort to improve the quality or quantity of the natural feed, from 1,000 to 1,400 sheep would be carried.

An analysis of the farming systems of the ten typical farms previously referred to as possessing an average of 1,500 acres shows that on this average farm—

1 acre in every 5.7 is annually sown to wheat,
1 acre in every 5.8 is annually fallowed,
1 acre in every 14.5 is annually sown to oats.

The remaining 812 acres are under natural grass, and on it, roughly, 500 sheep are maintained. Two of these farms contain some mallee land, hence the number of sheep is probably somewhat on the low side.

Some of the Lines of Future Progress.

Though the almost uniform dependence on the system of farming mentioned, together with the crops named, is most striking, the results achieved by certain individual farmers are definite enough to point the way in which progress may be made in the future.

Attention to the Fallows.

From a wheat-growing point of view, the special attributes of the most successful men and the points to which they find detailed attention necessary have already been referred to. The same men regularly obtain maximum yields, but among the rank and file there is plenty of room for improvement.

Perhaps the direction in which the majority can easily effect reform is in the maintenance of the fallows; there is a tendency to trust too much to the sheep to keep the fallow in order, which is frequently permitted to set down for months, and a bare minimum of cultivation is given.

It is certain that this method, while it can be followed on large holdings with benefit to the sheep and with economy of labour, is not the one that gives the maximum yields of wheat. On smaller farms, where the unit of plant is sufficient to cultivate the fallow as often as may be desirable, the greatest net profit can only be realized when the whole of the necessary work is done and the maximum yield secured.

An example, among a number of others, of a large farm, where considerable attention is paid to cultivation of the fallow, is that of Mr. C. F. H. Reichelt, at Woorak West. This farm of 1,300 acres is on the "fringe" country, and also contains some mallee land. A paddock of black soil, on which the winning crop this year was grown, received the following treatment:—It was ploughed in June and July, and cross-harrowed after a rain. It was spring-toothed in September and subsequently cross-harrowed. In October, it was cultivated with a cultivating-scarifier, and then harrowed. In February, after 120 points of rain, it was spring-toothed. Portion was again spring-toothed in April after being sown with a cultivator drill.

An instance of a 640-acre farm, where the maximum of working is given, is that of Mr. Collins, at Woorak. At this farm it was found possible with a one-man plant, to give 90 acres of summer fallow ten necessary workings, and 116 acres of winter fallow received six operations up to seed time. In addition, 50 acres of oats were sown, and the usual farm routine maintained.

The Use of Pedigree Seed Wheat and Increased Quantities of Manure.

The use of selected seed from the Seed Stations is becoming general throughout the district, but there are still many who do not take the trouble to secure the enhanced returns that it has been demonstrated this seed produces. The average quantity of manure applied is in the vicinity of 56 lbs., though a gradual increase is noticeable as a result of the tests at Longerenong and Warracknabeal. At both these centres it has been demonstrated that the application of 1 cwt. of superphosphate has given an increased return of 3s. 6d. per acre over and above the cost of the manure as compared with a half cwt. This figure is the average of five years' results, including a drought year.

Diversified Agriculture.

There are those who have realized that wheat and sheep are not the only activities that pay for skilled and systematic attention. Some have found that there are payable crops besides wheat and oats, and some know that there are temporary pastures that will support more sheep to the acre than natural grass and wild oats. Again, stock other than sheep, receiving but a minimum of attention, but handled in the right way, have yielded good financial returns.

It is by the partial utilization of existing plant and labour along one or other of these lines, together with the consequential adjustment of existing activities (and extensive changes are not advocated), that the biggest net profits per acre are being realized in the Wimmera to-day.

In a general way, in spite of the fact of the relatively favorable price of sheep products as compared to wheat, it is not a case of "wheat *versus* sheep," but rather the efficient production of more wheat and more oats and more sheep, and of any other crops or stock that may suit the special cases. Barley is a crop with which a few are achieving success. Linseed is one that could be tried in the future. Handsome returns are being secured by a few by careful management of pigs or poultry. Of course, a fundamental requisite of any of these activities is that they shall be capable of being worked with a minimum of labour.

Some of the foregoing contentions are well supported by systematic information that has been secured from a number of farmers of the district as to their average gross returns from each department of the farm for the past five years. The figures are most instructive, and show that the gross returns over the whole farm range from £1 per acre to over £2 per acre. Of course, the larger the farm the smaller the gross returns per acre; but the greatest differences between individual cases are to be found in the returns from the various departments

of similar farms. These differences can be closely correlated with the individual methods of the farmers. For instance, there are those who have obtained an average gross return of £6 per acre for each acre under wheat, as against those with the same plant and labour realizing only £3 per acre. The reasons have already been referred to. The same differences are observable between the returns obtained for oats, the usual practice for seeding which is to sow it on a stubble, with little preparation or manure. The average return from oats is little better than £1 per acre, but there are some who have averaged over £3 per acre, though the oats were also sown on stubble. In this latter case the crop was given reasonable treatment. It is, perhaps, worthy of note that it is the opinion of several of the farmers that it will pay much better to grow it on fallow.

Instances of Increased Returns from Improved Temporary Pastures.

The returns from sheep exhibit the same differences. The higher returns are partly due to the better class of sheep kept, but are mainly the result of attention to the provision of sheep feed. The great period of feed scarcity in the Wimmera is in the autumn, and to alleviate the shortage Messrs. Crouch Bros., of Kaniva, find it profitable to sow a small quantity of oats on stubbles immediately after harvest. The operation is accomplished with a minimum of cost and preparation. About half a bushel of oats is simply drilled on the burnt stubbles without manure or other preparation, and yet it is stated that the feed carrying capacity is doubled at a cost of not more than 4s. per acre. The oats is sown dry, and there has never been a failure. The crop is wholly sacrificed to the sheep. There are others, such as Mr. Chris. Dahlenberg, of Nhill, who endeavour, with marked success, to increase the feed in the paddocks being thrown out to grass. The plan followed is to sow with the cereal crop and, therefore without extra labour, half a pound of *melilotus parviflora*, and sometimes a few pounds of Italian rye grass are added. The result in feed pays handsomely for the trouble, and when the paddock is ultimately broken up the soil is enriched by the ploughing under of the leguminous residues.

In November the writer visited the Minyip district, and was afforded the opportunity of inspecting two paddocks, each several hundred acres in extent, upon which a variety of rye grass, apparently differing from either the Italian or English variety, had established itself. One of these paddocks had been heavily stocked up till October, and was then shut up for seed. On it there was a dense crop of the grass, probably averaging 15 inches high. The grass, which at that stage possesses a characteristic purplish-red stem, at any rate on the black soils at Minyip, was seeding heavily, and it was stated that an extremely payable yield of seed had been obtained the year before by shutting it up and stripping it. Another paddock of 196 acres, belonging to Messrs. Barnes and Young, was being grazed by sheep. On it 300 ewes had been lambed down, and a truck of the best lambs topped the market at 32s. 6d., while the rest were sold as freezers at £1 per head. Owing to a second mating, a second lot of 100 lambs were grazed in the paddock, which was

still carrying the whole of the ewes, yet there was plenty of feed—and that after six months' continuous feeding. It is estimated that a good paddock of this grass will lamb down a sheep and a half to the acre in an average year. A Mr. F. Franklin is stated to have planted some twenty years ago the seed of this grass, but where it was obtained is not at present known. Other seed was planted by Messrs. McDougall seventeen years ago, and the grass has now spread over hundreds of acres in this district alone, and has been reported in other districts, though in these cases the occurrence may have no connexion with Minyip. At Minyip the grass grows well on red and black soils, and instances are quoted where it has thrived on sandy soils at Jeparit. It re-seeds itself annually, and the paddocks mentioned have never been re-seeded. The samples of the grass, when shown to Professor Ewart, were provisionally stated to be *Lolium subulatum*, a native of Southern Europe, not hitherto identified in Victoria, and of which the habits are not known.

Mr. Geo. Batson's Pigs Grazing on Pease.

The grass was commented on by Mr. Temple A. J. Smith in his Nhill report three years ago, but was not then known to be a distinct variety. It is probable that one of the factors that has prevented a more extensive sowing of the grass is that people in obtaining seed from seed merchants merely asked for Italian rye. The occurrence of the grass in isolated patches may be due to stock.

With the methods of cultivation tried so far, it is stated that cereal crops, planted after the grass-land has been fallowed, are liable to be choked out by the grass, and therein lies the drawback; but so remarkable is the bulk and sustaining character of the feed on most of the soils in the localities mentioned that as a grazing proposition alone it is worth the immediate, though *cautious*, attention of wheat farmers desiring to improve the stock-carrying capacity of their farms.

Instances of Good Results from Pigs and Poultry.

The returns under the head of Sundries show that some farmers are receiving as much as 5s. per acre over the whole farm, while their neighbours do not receive 6d., and yet the labour available in the first

case is no more than in the second. An example of what can be done is to be seen at the farm of Mr. George Batson, Nhill. Besides the sowing of considerable areas of wheat and oats, and attention to numerous sheep, Mr. Batson finds time to breed and fatten a considerable number of pigs. Judging by his interest in the matter and his remarks as to his returns, he is well rewarded for the time and labour expended.

The Berkshire breed is favoured, the large York being found to scald badly in the summer, and in the winter to require scrubbing before being presentable to buyers. Two paddocks, upon which a good dressing of farmyard manure from the stables is regularly applied, are sown to dun peas and cape barley respectively. The barley provides early winter grazing for the young pigs. When that is finished, and the peas are ripe, the pigs are turned in to graze them also. The peas and barley are alternated each year in their respective paddocks, which are ploughed as soon as possible after being cleaned up; partial fallow is

Some of Mr. C. H. Roediger's Profit-earning White Leghorns.

therefore secured. In addition to the small paddock for forage barley, a further 15 acres of barley is regularly sown for grain; this is fed off with sheep until about the middle of August, and yields ranging from 40 to 60 bushels per acre have been obtained since the last drought. The young pigs, supported at first on the succulent feed, and then hardened up on the peas, are next shut up and topped off with crushed barley, fed wet until the last three weeks, when it is fed dry—the water then being placed in another trough. The pigs fed in this way, if bred on the place, weigh from 130 to 140 lbs. at six to seven months; the average price received for them is about 85s.

Another activity which Mr. Batson has shown to be profitable is that of sowing peas on fallow for sheep feed. In eight years only one failure has been experienced; that was at the last drought, when 40 bushels of dun peas were sown on 25 acres, and not a plant came up. The Yorkshire Hero variety is preferred when the price is low enough, as the white colour enables the sheep to pick them off the soil easily.

Mr. C. H. Roediger is one of those who conduct their poultry department on the right lines. The fowls are not permitted to stray and lay anywhere, or to roost on the binder reels. Proper yards are provided, and a number of fowls of tested strains have been purchased. Careful attention is given to culling unproductive birds and to the feeding.

These few activities are quoted as thoroughly tested instances of successful diversification. To express the matter in a nutshell, although great improvements in the future can be achieved by many in the returns from the wheat crop, perhaps the biggest field lies in that part of the farm which is at present allowed to take care of itself.

An improved temporary pasture is badly needed for the sheep, while in the direction of pigs or poultry, &c., there are handsome supplementary returns awaiting exploitation.

The Competition, 1918.

The Nhill Agricultural and Pastoral Society is to be congratulated on the successful completion of the 16th competition held since the inauguration in 1903. That the interest has been well sustained in the district is evidenced by what is stated to be a record entry of competitors, and that it has spread to other districts is shown by the sprouting up of competitions modelled on the lines of that at Nhill.

The season was distinguished by a wet May, which delayed the preparation of the seed bed, and by a dry September, which severely tested the crops. It was noticeable that those crops grown on fallow, where efforts had been made to conserve the maximum of moisture by effective mulching, stood out by themselves. The lack of rain in September also interfered with the preparation of many of the present year's fallow with the result that, on the whole, they were not so good as usual.

Results.

No. 1.—Best Exhibited Half of Wheat Crop not less than 75 Acres.

Name.	Variety.	Apparent Yield.	Type.	Evenness.	Weeds.	Disease.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
C. F. H. Reichelt ..	Penny Federation ..	35	19	15	14	13	96
R. Blackwood ..	Penny Federation Leatherhead ..	34	19	14	13	13	93
David Jones ..	Federation ..	33	19	15	13	12	92
Peter Bone, jun. ..	Currawa Leatherhead Red Russian ..	29	17	14	13	14	87
Crouch Bros. ..	Federation ..	26	19	13	12	12	82
Sallman and Schultz ..	Federation ..	28	17	14	11	11	81
Sallman and Glatz ..	Federation ..	25	17	14	9	11	76
H. Reichelt	Federation ..	19	13	13	11	13	69
Ivan Young ..	Penny Federation ..	25	16	9	5	9	64
W. N. Tassicker ..	Federation ..	20	13	10	7	12	62

Comments on No. 1.

Mr. Reichelt's crop was mainly Penny, but a little Federation was shown. The crop was true to type, dense and level, and will yield heavily. As a show crop it left nothing to be desired; the only fault that could be detected was the presence of a little flag smut. The treatment of the fallow on which this crop was grown has been previously discussed. The sowing was made in May and early June, at the rate of one bushel to the acre, and with 50 lb. of super. The fact that the crop had been put in reasonably early, and that the fallow had been well prepared, stood it in good stead this season. The cultivator-drill, which performs the work of scarifying and drilling, enabled Mr. Reichelt, this year, to concentrate on seeding operations the moment weather conditions became favorable; but the use of this drill in the hands of any one less thorough than Mr. Reichelt will not prove an advantage if it be used to supersede legitimate cultivation. The crop was not fed off to sheep.

Mr. C. Reichelt's First Prize Crop of Penny.

The second and third crops, both of which will also yield heavily, were grown on summer fallow. Mr. Blackwood, the winner of last year's competition, again showed a very creditable crop comprising Penny, Federation, and a variety called Leatherhead, which has a taking appearance, though the head is lax in character. It is tall, said to make satisfactory hay, besides giving good yields of a dark shotty grain. The preparation of the fallow on which these crops were grown was as follows:—In March the land was ploughed to a depth of 5 inches, the object being to completely bury the remains of burnt stubbles and thus insure their complete decay and thorough incorporation into the soil. The harrows were applied immediately after ploughing. At the end of June and July the paddock was cultivated with a skim plough, from which the mouldboards had been removed, with the object of cutting weeds and at the same time stirring the soil to a depth of 2½ to 3 inches without disturbing the existing arrangement of the soil layers. It was then harrowed; subsequently during the spring it was twice spring-toothed while weeds were small. After the first autumn rain it was given another light spring-toothing; it was scarified and drilled in mid-

May and June at the rate of a bushel of wheat to the acre, with 56 lb. of superphosphate (on red ground 80 lb. is applied). The crop was fed off with sheep, but, owing to heavy rain, was not harrowed afterwards, as is the usual practice.

Mr. David Jones showed a fine crop, which was remarkably level and even; it was also very clean under foot. The crop was, however, not so dense as either of the above-mentioned crops, and lost points as a result of the presence of flag-smut. It was grown on a small farm where it is usual to sow equal areas of wheat and oats in rotation. Additional wheat is sown outside on the share system. Owing to labour difficulties since the war, the wheat on share has had to be curtailed, and the growing of oats on the farm temporarily abandoned and wheat sub-

A Crop of Leatherhead at Mr. R. Blackwood's Farm.

stituted. The present crop is sown on a fallow from which, in the previous year, a 39-bushel crop of wheat was obtained. The land was ploughed dry in March, then harrowed, grazed with sheep, and scarified in October. The roughest part was again cultivated, and the whole scarified up and sown in June with one bushel of select pedigree Federation wheat and 56 lbs. of manure. This crop was eaten off till the end of August.

The remaining crops were all grown on winter fallow, practically none of which received the same care in preparation as those of the two leading crops. An interesting case of the value of a light harrowing after the crop was up, in removing weeds such as poppy, was to be observed in Mr. Peter Bone's crop, where the difference between treated and untreated strips showed plainly. There was evidence of take-all in most of the crops, and flag-smut was particularly bad this year. Ball-smut was noticed in two of the crops. Flag-smut, so prevalent in this and other districts this year, has resulted in considerable loss, which may be put down as averaging quite 5 per cent., though it often passed unnoticed, the thinning of the crop being put down to dry conditions. Flag-smut is due to a fungus which lives on the wheat flag, and is capable of persisting over the seasons on the straw. It cannot live on oats. The treatment is to thoroughly burn the stubbles of badly infected crops, and care should be taken not to feed infected hay to horses while working up the land, as the spores or seeds of the fungus may pass through them unharmed.

The treatment for ball-smut is too well known to need comment; its presence usually arises through not pickling in a definite way; the strength of the pickle is guessed at: it should be made up by weight. The time of immersion may not be carefully checked, seed in which smut balls are unnoticed may not be immersed in the pickle, or sufficient care may not be taken to skim off the smut balls, which are almost sure to cause reinfection if allowed to remain. The standard strengths of pickle are—

Bluestone, 1½ lbs. to 10 gallons of water, immersed 3 to 5 minutes.
Formalin, 1 lb. to 45 gallons of water, with the same time of immersion.

No. 2.—Mallee Crop not less than 100 Acres.

Name.	Variety.	Apparent Yield.	Type.	Weeds.	Disease.	Evenness.	Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**
C. H. Roediger ..	Penny Yandilla King Federation ..	30	18	15	15	15	93
D. R. McKenzie and B. Petchell	Federation ..	25	17	11	14	14	81
J. B. Marshall ..	Federation Penny Currawa ..	19	18	10	13	14	74
O. H. Liernert ..	Federation Yandilla King Penny ..	17	18	12	13	13	73
L. R. Simon ..	Federation Penny ..	14	18	12	10	13	67
H. Reichelt	Federation ..	20	10	9	10	13	62

Mr. Roediger exhibited what was certainly a model field of three varieties, viz., Penny, Yandilla King, and Federation, all from select-bred pedigree seed. The crop was extremely level and even throughout, quite free from disease, and there was a complete absence of weeds under foot. The straw was strikingly clean and mellow, the flag having

withered away so naturally as to still preserve its shape, indicating that the crop had come to maturity under perfect conditions. The soil on which the crop stood was a friable black loam, and though eligible under present rules in this class, was decidedly better than that on which the rest of the crops exhibited in this section were grown, a fact which opens up the question of the apparent desirability of allowing the judge discretionary powers of handicapping certain classes of

Mr. C. H. Roediger's Winning Mallee Crop of Penny, Yandilla King, and Federation.

Mr. J. Collins' Crop of Federation.

soils. Mr. Roediger's paddock was given the following treatment:—After several oat crops it was ploughed in winter and harrowed; it was scarified in the spring and again in the autumn. The paddock was drilled in June and harrowed afterwards. Federation and Yandilla King were sown at the rate of one bushel per acre, but the Penny was sown 10 lbs. heavier, as this variety has a tendency to come up thin. Eighty lbs. of superphosphate were used.

Messrs. D. R. McKenzie and B. Petchell showed a good crop of Federation wheat, level in character, but not so thick as could be desired.

There was absence of disease, but wild oats was prevalent; the previous crop was oats. The fallow was scarified in October, which is later than usual, owing to the wet. Subsequently it was scarified at the end of March, and again before seeding; the sowing was made during the last week in May, at the rate of a bushel to the acre, with 70 lbs. of superphosphate.

None of the remaining crops was so heavy, owing to a variety of causes. In one case it was due to a late sowing, in another to the combined effects of a deficiency of labour and an attempt to sow a large area.

No. 5.—BEST WHEAT CROP GROWN ON FALLOW LAND, FALLOW JUDGED 1917, AND CROP GROWN ON THE FALLOW 1918. CROP POINTS AND FALLOW POINTS TO BE ADDED TOGETHER.

Name.	Variety.	Apparent Yield.	Type.	Evenness.	Weeds.	Disease.	Crop Total.	Fallow Total.	Grand Total.
Possible Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
C. F. H. Reichelt ..	Penny Federation ..	35	19	15	14	13	96	95	191
R. Blackwood	Penny Federation Leatherhead ..	34	19	14	13	13	93	94	187
J. Collins	Federation ..	31	19	13	12	13	88	96	184
Crouch Bros. ..	Federation ..	26	19	13	12	12	82	91	173
David Duthie	Penny Federation ..	27	18	12	14	10	81	91	172
R. Keller	Penny Federation ..	24	19	12	13	11	79	87	166

COMMENTS.

In this section the crops of the first two competitors were the same as in section one. Their methods have already been discussed. Mr. Collins showed a very creditable crop of Federation, which had been grown partly on summer fallow and partly on winter fallow, and had been freely worked as previously mentioned.

No. 3.—BEST FALLOWED LAND, NOT LESS THAN 100 ACRES.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Totals.
Possible Points ..	.. .. ..	**25**	**25**	**25**	**25**	**100**
H. Reichelt	Black	24	24	24	24	96
R. Blackwood ..	Black, red patches ..	22	22	25	23	92
Peter Bone, jun. ..	Black, red patches ..	21	21	25	24	91
Crouch Bros.	Black	24	20	25	21	90
C. F. H. Reichelt ..	Sandy loam over yellow clay	24	19	25	22	90
D. R. Mackenzie and B. Petchell	Sandy loam over clay	21	19	25	25	90
J. T. Duthie	Black, red patches ..	20	19	25	25	89

Comments on No. 3.

The rainfall received at Nhill this season since winter was a considerable divergence from the normal, thus—

	August	September.	October.	November.
Average twenty years	173	187	177	98
1918	153	40	183	13

The dry September and November rendered the task of determining just how to treat the fallow a difficult one. None can tell how long a dry spell will continue, so that the average season must always be catered for.

Those who place large dependence on the sheep in keeping the fallow in order were rewarded with a firm seed bed, but at the cost of the mulch, the sole guardian of the moisture during the summer months. Those who depended on frequent workings as well as sheep, have found it difficult to effect the necessary consolidation underneath, but they can face the summer well satisfied that the whole of the moisture will be retained, and that consolidation will improve. The most successful method this year has been a judicious combination of the use of sheep with moderate working. Messrs. H. Reichelt, Crouch Bros., and C. F. H. Reichelt exhibited fallows which showed practically a maximum of moisture. In the case of the two last-named the subsoil was of a particularly retentive clay. This had assisted in a somewhat defective mulch, in retaining a full water content up to the present. The mulch in the one case was too shallow, and in the second had been allowed to form a surface skin. In the absence of rain and subsequent working these two fallows may be expected to dry out with increasing rapidity as the season advances.

Mr. H. Reichelt's fallow, besides possessing a high percentage of moisture, was effectively mulched with an even 2½ inches of loose soil, yet it was nicely consolidated. The best part of the fallow was ploughed in April, and harrowed subsequently, and received three light scarifyings with the object of destroying weeds. Another portion was ploughed in June and harrowed; it was scarified in September.

Mr. Blackwood's fallow, which did not contain so much moisture and somewhat lacked consolidation, was nevertheless well mulched, and should come through either a wet or dry summer equally well.

Mr. Peter Bone and Messrs. D. R. McKenzie and B. Petchell and Mr. J. T. Duthie showed fallows that indicated care and cultivation, but which were deficient in some other respect.

No. 6.—FOR THE HIGHEST AGGREGATE OF POINTS AWARDED TO—

The whole of a farmer's fallow, 1918.
The whole of the crop, 1919.
The whole of the fallow, 1919.
The whole of the crop, 1920.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points ..	.. ..	**25**	**25**	**25**	**25**	**100**
H. Reichelt	Black, rising ground red	23	23	23	22	91
P. Bone, jun. ..	Black, red in patches	20	21	25	23	89
C. F. H. Reichelt ..	Red loam and light sandy loam on clay	23	18	23	20	84
R. Blackwood ..	Black, red in patches	20	21	22	20	83
J. Collins	Black, rising ground red	19	19	24	20	82
O. H. Leinert ..	Black, red in patches	20	21	21	20	82
Crouch Bros.	Black, red in patches	22	18	23	19	82

COMMENTS.

This competition, which is due to the suggestion and the generosity of Mr. A. G. Schultz, sets the competitors a more severe task than the preceding one; every paddock of fallow must be exhibited for two years, and the crops on those fallows for a like period. Most of the competitors, with the exception of H. Reichelt and P. Bone, lost heavily because some of their paddocks were not in show condition.

* * * * * * * *

In conclusion, I would like to commend your able secretary, on whom devolves the many onerous tasks necessary for the success of the competition, on his capable assistance and efficient arrangements. Nor must I omit to thank those whose hospitality added materially to the pleasure of the trip, especially in the case of those who provided means of locomotion. All competitors showed an earnest desire to co-operate in the work by the readiness with which they answered numerous questions.

Might I be allowed to wish the society every success in the future in its pioneering efforts for "better farming," "better business," and "better living."

APPLE CULTURE IN VICTORIA.

(Continued from page 37.)

By J. Farrell, Orchard Supervisor.

San Jose Scale (*Aspidiotus perniciosus*)—continued.

Good results have been obtained from crude petroleum emulsion, 1 in 8 and 1 in 10, against apple bark scale, woolly aphis, and red spider, and being much cheaper than red oil, it is a popular spray for this purpose. The freedom with which the emulsified condition of this oil is formed and maintained also assists in popularizing this spray. Its effectiveness against San Jose scale, however, is hardly comparable with that of good red spraying oil.

Although lime-sulphur is essentially a fungicide, its effectiveness in destroying red mite, aphis, and scale insects is favorably spoken of by persons who have used it, but the writer's experience is that oil sprays are much better. At the same time, Mr. G. M. Fletcher, Orchard Supervisor, in charge of the Goulburn Valley district, reports that satisfactory results followed the treatment of San Jose scale with lime-sulphur during the last spraying season.

Hydrocyanic Gas Treatment of Scale Insects.

When the eradication of San Jose scale or other like pest from an orchard or from a district is being contemplated, it should be recognised that hydrocyanic acid gas is the most effective and reliable agent at present known by which this object may be achieved. This gas being generated from sulphuric acid, cyanide of potassium, and water, is most destructive to insects within the range of its influence.

Fumigation as a means of destroying citrus pests has been fairly extensively employed, but the gas treatment of those infesting deciduous trees is limited. The tree to be fumigated is enclosed in a tent or sheet made of strong unbleached calico or other suitable material. Then the approximate cubical content of the tent, which is usually irregular in shape, is found by multiplying its mean height by the square of its mean diameter. When fumigating a number of trees of one variety, the same age, and growing under similar conditions, it is only necessary to take the measurements of one, and adopt the cubical content calculated as described as a standard, for under the system of modern pruning the trees will be uniform in size and shape. When the covering is put over the tree, earth should be placed on the bottom edge of the tent material, so as to prevent the escape of gas during the process of fumigation.

The amounts and proportions of gas-producing chemicals required for any given space may vary somewhat, but these can be regulated according to circumstances. One fluid ounce of sulphuric acid, 3 fluid ounces of water, and 1 ounce of cyanide of potassium may, however, be regarded as a fair approximation of the quantities necessary to sufficiently pollute each 150 cubic feet of air space and destroy scale insects within a period of 45 minutes. A glazed earthenware vessel is used in which to generate the gas. The water is first placed in this, then the sulphuric acid is poured in and the vessel placed under the tent. A small opening is provided under the tent through which the hand is admitted, and the cyanide is carefully dropped into the acid and water

solution. Gas generation quickly follows, and after a period of about 45 minutes the tent may be removed to the next tree to be treated.

The results of the action of the gas on the insects may be determined in about seven days after its application. If the scales be violently disarranged, numerous mummified recumbent forms will be revealed; if eggs be present, they will have become discoloured and shrivelled.

Mr. A. A. Hammond, Orchard Supervisor, in charge of the Doncaster district, in his article on "Fumigation for the Destruction of Scale Insects,"* gives interesting details, including fumigation tables, &c.

Mr. S. A. Cock, Orchard Supervisor, in charge of the Bendigo and Northern district, in his "Citrus Culture in Victoria,"† deals with hydrocyanic gas fumigation, and also gives dosage, tables, &c.

The articles mentioned are written mostly in connexion with citrus fumigation, but the main principles governing this are similar to those involved in the like treatment of deciduous trees.

APPLE BARK SCALE (*Mytilaspis pomorum*).

These small mussel-shaped scales so much resemble the bark to which they attach themselves that, except when present in great numbers, they are difficult to detect. This pest, which is confined mostly to the cooler districts of the State, like the San Jose scale, was probably introduced into this country on nursery trees. If spraying treatment be neglected, the insects quickly increase in numbers, and become a menace. This is evinced by the annual rapid multiplications of scales, which in winter contain great numbers of eggs. The young hatch out in spring and crawl over the bark until they find suitable parts on which to settle. Then they commence sucking the juice of the tree, and construct their protecting scales. The fruit is frequently made the host of many, resulting from later incubation.

While in the egg stage is also the best time to begin operations against this pest, and by the use of crude petroleum emulsion 1 in 8, or red oil 1 in 15, it may be quickly subdued. The eggs are produced under the female scales during autumn, therefore the infested trees should be sprayed as soon as the leaves drop, and again during winter if necessary. When dealing with scale insects, the need for a second or subsequent spray may be determined by ascertaining the condition of the treated insects or eggs, as the case may be. An ordinary pocket lens is employed in the examination, and, generally speaking, when the eggs present a dry, shrivelled appearance, and the scales are easily detached from the bark, the spray has been effective. The contents, whether insects or eggs, of the scales on which the spray is effective will, normal weather conditions prevailing, have dried up in about fourteen days. Then the effectiveness of the spraying ordeal may be calculated on the amount of moisture appearing on the surface of a given area of scale-infested bark after the blade of a pocket knife has been carefully pressed over it.

THRIPS (*Thrips tobaci*).

These comparatively long, tiny insects, although only large enough to be visible to the naked eye, do, when the weather conditions favour

* *Journal of Agriculture*, Victoria, June, 1912.
† Bulletin No. 32 (new series), Department of Agriculture, Victoria.

them, considerable damage to the flowers of fruit trees. In fact, the crop yields from the late-blooming apples during recent years have been regulated largely according to the severity of the thrips' visitation. If the weather be dry and warm during October, when the apple trees are in bloom, much damage is done, but comparatively low temperatures, with frequent intermittent showers at this time, practically control this pest.

During the blooming period of the 1918 season, frost was responsible for considerable damage to the early-flowering varieties. While the late sorts were blooming, many showers fell, but as these were alternately followed by relatively long periods of comparative warmth and calm, almost complete destruction of the blooms by thrips ensued. The attack was so virulent that the London Pippin and Rome Beauty crop is, in proportion to the area under these varieties, probably one of the lightest on record for the State.

Natural expansion of the petals, to gradually admit sunlight and air to the sexual organs of the flowers, in order to secure their healthy development and facilitate pollination, is a condition essential to successful fruitsetting. The adult forms of the thrips, now so well known to fruit-growers, are proficient fliers and very active. The greatest damage is caused to the vital organs of the blooms before the time of opening. The adult insects gain admission to the flowers by wriggling through small openings between the petals some time before their general expansion commences. On entering the immatured flowers, the insects attack the embryonic forms of the stigmas and anthers by sucking their juice, thereby causing these organs to shrivel up. The petals, in consequence of their inner surface being attacked in like manner, prematurely wither and turn brown. Being weakened in this manner, and because of the presence of a slight sticky secretion consequent on the flowers having been made the habitation of the insects, the petals are rendered incapable of expanding. When this condition is reached, rapid reproduction takes place, and large numbers of thrips in the different stages of their existence may be found inside the flowers.

Luckily the first two or three weeks in October are usually sufficiently cool and wet to control the thrips and afford the early-blooming varieties, which include the vast majority of those under cultivation, favorable conditions for setting.

The thrips being very active and sensitive to agitation, quickly evacuate their positions around the bloom buds on being disturbed by rain, which destroys many of the early-matured insects, and prevents others ascending to higher positions on the trees. When these gain admission to the closed flowers, however, the case is different, as then no amount of agitation will dislodge them. In dealing with thrips, it is realized that, because of the great numbers in which they appear, and the rapidity with which they multiply, the sprays used against them should be destructive and act as a deterrent as well. Tobacco water, benzol emulsion, coal-tar water, &c., have given fairly good results on limited areas, but to satisfactorily cope with this pest in large commercial orchards is a difficult proposition.

FUNGUS DISEASES AND THEIR TREATMENT.

Spraying with fungicides for these lowly forms of plant life, which parasitically attack the trees, the fruit, or both, is another phase of orchard management which annually demands timely and prompt attention. It is safe to state that never during the history of commercial fruit-growing has the war against these diseases been more scientifically and energetically waged than at the present time. It is plain, nevertheless, that the unsatisfactory results, which, owing to the varying climatic and other conditions, sometimes follow even the most careful spraying, denote that complete mastery over fungus diseases is difficult to attain. Under ordinary soil conditions, these fungi vegetate most luxuriantly, and fructify most prolifically in the shelter of dense foliage, if the leaves be somewhat moist and the weather moderately warm. But sunlight and fresh air, Nature's two great disinfectants, when admitted by scientific pruning to all parts of the branch systems of the trees, assist materially in subduing fungi. Much difficulty is experienced in dealing with fungi under the humid atmospheric conditions which usually obtain on flat, deep, rich, moist siltations, and especially when the orchards are situated in secluded valleys.

As well as the special conditions favouring the development of fungi just mentioned, it may be further stated that certain diseases are more prevalent in some districts than in others. Moist weather conditions during the vegetative periods favour their development, and some varieties of trees are more liable to infection than others. Although spraying is general and thoroughly executed when the setting of a medium to heavy fruit crop is anticipated, some growers do not spray when the prospects of a light crop are apparent. In the interests of fruit-growing generally, it may be mentioned that spasmodical spraying efforts cannot be regarded as satisfactory, because, during the term of the growers' inaction, the diseases are allowed to re-establish themselves. When the foliage is liable to be attacked as well as the fruit, the former should be protected by spraying. Careful apple-growers spray young trees such as Yates, which is subject to black spot, prior to its arriving at the bearing age in order to maintain a maximum of healthy leafage, which promotes vigorous growth.

In writing up the subjects connected with fruit-growing, and particularly those relating to pests and diseases, it is difficult, owing to the many indispensable technical terms involved, to treat these matters with the degree of clarity and simplicity desired by the orchardists. Supervisors, however, when visiting growers not versed in the official phraseology of the departmental publications, will endeavour to explain away the apparent complexities and difficulties which confront orchardists. Because a wet spring encourages the growth of fungi, when much damage is done to fruit trees, some growers argue that the injury is solely due to rain, but only persons unacquainted with the parasitic nature and development of the accompanying destructive agent would entertain such an erroneous idea.

BLACK SPOT OF THE APPLE (*Venturia inaequalis*).

The spores or seeds of this fungus, which, especially in wet seasons, is a source of great anxiety to apple-growers, were probably introduced into Australia on the first imported trees. Speaking generally, the

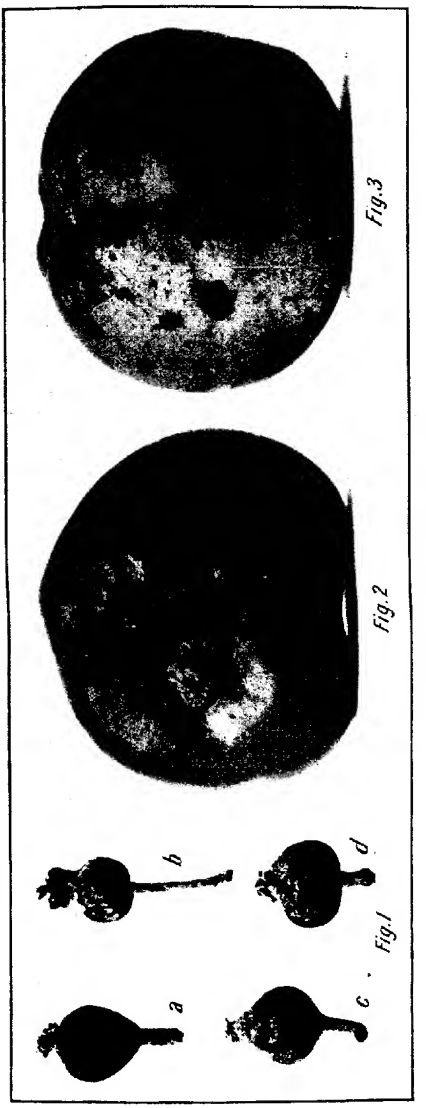


Plate 188.—Effects of Black Spot.

Fig. 1.—Early Infection. Fig. 2.—Mid-season Attack. Fig. 3.—Late Spotting.

districts of Victoria best suited for apple culture are also the most favorable for the growth of black spot. Prior to the more general use of Bordeaux mixture, copper-soda, and lime-sulphur, the damage caused to fruit, as well as the losses which resulted from the injury done by black spot to the foliage were enormous. Since the growers have more extensively practised spraying with fungicides, however, losses from these causes have been very considerably reduced.

It is now generally recognised that two forms of spores are involved in the perpetuation of black spot—the conidial form produced during the fusicladium stage on the surface of the leaf or fruit on sporo-bearers which pass through the epidermis during the vegetative period, and the ascospores, the perfect form, which are contained in sacs or asci and protected by a case or perithecium in the old leaf in the soil during winter.

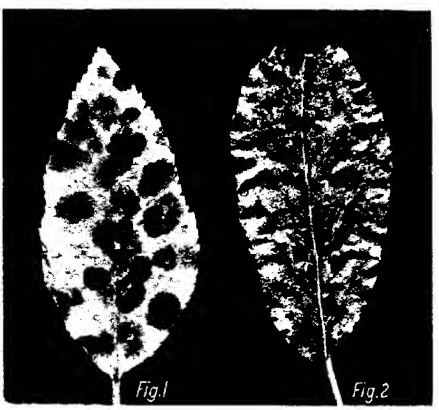


Plate 189.

Fig. 1. Rome Beauty leaf suffering from early infection. Fig. 2. An old Jonathan leaf carrying winter spores of black spot.

That the fruit is liable to be attacked at any time during its development when the weather conditions favour the growth of black spot is illustrated by the reproduced photographs in Plate 188, which depict three stages of the affected fruit. The leaves also may become spotted at any time under similar conditions. Fig. 1 shows four varieties of apples about three weeks old; (*a*) is Anna Elizabeth, (*b*) London Pippin, (*c*) Rome Beauty, and (*d*) Irish Peach. These four varieties do not appear in the full-bloom stage at the same time, and specimens fairly uniform in age and size were desired for illustration. Therefore Anna Elizabeth and Irish Peach, produced from late blooms, were selected with London Pippin and Rome Beauty from early flowers of these varieties. It will be observed that the little apples are badly attacked with the spot, and that the Irish Peach has already commenced to crack. The condition of the fruit, as shown at this stage, is known as "early infection." The London Pippin apple, in Fig. 2, was infected when it had almost

attained full size. The cracking and contortion, so pronounced in this specimen, are due to the force of contraction in the diseased part operating against the force of expansion in the healthy portion. This condition at the stage mentioned is termed "mid-season attack." Even at the end of the ripening period, when fully matured on the trees, or later when stored in the ordinary manner, the fruit is liable to be infected. The ripe London Pippin apple, illustrated in Fig. 3, depicts this condition, which is called "late spotting."

The illustrations in Plate 189 show the condition of leaves carrying the spring and winter forms of spores respectively. Fig. 1 is a Rome Beauty leaf suffering from early infection, and showing dense clusters of black spores on its upper surface. Fig. 2 is an old Jonathan leaf taken from the soil in winter. In this stage it contains the perithecia which protect the asci, in each of which eight ascospores mature later. On the return of spring, the ripe spores become liberated, and many, finding a lodgment on the young moist leaves or fruit, germinate by sending out spore-tubes which penetrate the hosts, probably entering through the stomata or breathing pores in the epidermis. Having passed through the cuticle, the spore-tube develops into a mycelium or root system, which destroys the cells immediately beneath the epidermis through which the spore-bearers soon emerge, and fusicladium spores are liberated on the surface. When the mycelium in a diseased spot has extended by radiation to its maximum, this part bulges upward somewhat from the plane of the leaf's surface. As the spots multiply and extend, the leaf dries out, and puckering continues until the parasite, having exhausted the nutriment of its host, is unable in this stage to further vegetate and fructify. Then the leaf, having lost its vitality, falls, and the mycelium changes to the stage capable of reproducing the ascospores.

The illustrations appearing in Plate 190* are highly-magnified sections of a diseased apple and leaf, shown natural size in Plate 188 and Fig. 1 of Plate 189, as well as the spores, &c.

The highly-enlarged section of the perithecium in Plate 191, Fig. 1, and the more highly-magnified asci, Figs. 2 and 3, containing the ascospores, were taken in early spring from a leaf in the condition of that appearing in Plate 189, Fig. 2. Fig. 4 shows two germinating ascospores.

When the early-produced leaves of the varieties more liable to early infection and sensitive to attack, such as Yates and Jonathan, become badly affected, they fall prematurely. The leaves subsequently produced, even when apparently free from this disease, are usually of a stunted character. The five Jonathan leaves in Plate 192 illustrate this condition. They were taken from the point of a lateral after those lower down were destroyed by black spot. They are natural size, and depict, in the various stages of development, leaves which would have grown at least twice as large had not the earlier foliage been destroyed comparatively early in the growing season. It is evident that trees allowed to become partially defoliated in this manner cannot thrive, owing partly to insufficient healthy leafage to carry on the necessary sap elaboration, &c., and partly to the dry, warm conditions set up in the soil around

* Reproduced from a plate in Mr. D. McAlpine's report on Black Spot and Spraying, Bulletin No. 17 Department of Agriculture (Victoria).

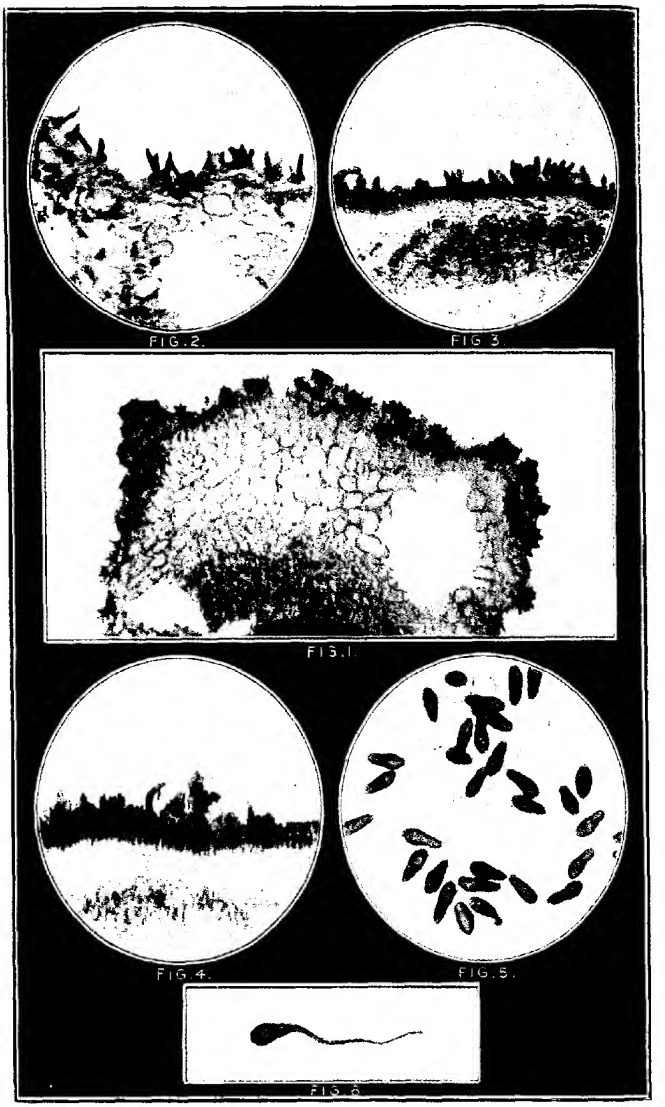


Plate 190.

Black spot fungus (see explanation opposite page).

Explanation of Plate 190.

Fig. 1. Section through the mid-rib of an apple-leaf, showing the dark clusters of spore-bearers, or conidiophores of the fungus *Fusicladium dendriticum*, arranged round the margin .. × 100

Fig. 2. Part of the same section more highly magnified, and showing the appearance of the individual spore-bearers .. .. × 200

Fig. 3. Section through a young spot on an apple fruit, showing the production of spores on the surface .. .. .. × 200

Fig. 4. Section through a well-developed spot on an apple fruit, showing the dense mass of spore-bearers, which is colourless at the base, but quite black at the top, with a few spores still attached .. .. × 200

Fig. 5. Group of spores from a spot on an apple leaf .. .. × 400

Fig. 6. Germinating spore from an apple leaf kept in a moist chamber × 400

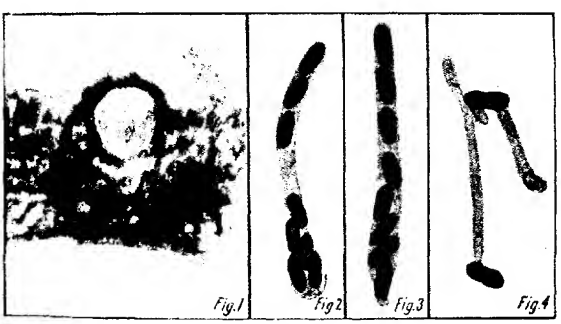


Plate 191.

Black Spot of the Apple.

Fig. 1. Section through dead fallen apple leaf in early spring, showing spore case or perithecium of *Venturia inaequalis* .. .. × 100

Figs. 2 and 3. Asci or spore sacs of *V. inaequalis*, each enclosing eight spores .. .. × 500

Fig. 4. Germinating spores of *V. inaequalis* .. .. .. × 500

the trees due to the want of the natural shelter afforded by the foliage to the root areas.

Preventive Measures and Remedial Treatment.

It is becoming generally recognised that the early appearance of black spot is due to the ripe ascospores finding a lodgment on the young leaves and fruit. It is also conceded that the most practicable and effective preventive measure is to plough in the old leaves as soon as they have fallen, and thus obviate the production of the ascospores by the rotting of the leaves in the soil during winter. A cover crop of field peas for green manure sown about the time of ploughing in the leaves also assists in suppressing the disease. In seasons favorable to its development, the spot begins to appear at the fruit-setting. In order that the soil may not be disturbed just prior to or at this period, the time of sowing should be arranged so as to enable the peas to arrive at the full-bloom stage, and be fit to plough under after the fruit has set.

Plate 192—Jonathan leaves showing development, etc.

The conservation of soil moisture by the maintenance of a fine surface, earth mulch, particularly where irrigation is not practised, is essential to the growth of the trees. Mr. H. M. Nicholls, Vegetable Pathologist, Tasmania, advocates leaving the ground undisturbed from the beginning of October to the middle of November at least, and, in the opinion of the writer, he supports this principle with sound scientific deductions. It should be understood, however, that, while the cooler weather experienced in the island State permits of a cessation of cultivation, the warmer climatic conditions prevailing on the mainland often necessitate intensive cultural operations at this time. This remark has special reference to orchards on light soils, and occupying exposed positions.

Bordeaux Mixture.

When as many as possible of the winter spores have been destroyed in the manner described and consistent with the principles involved, the remedial treatment of spraying with fungicides to arrest the development of germinating spores, which survive the preventive measures, should receive consideration. When the weather is comparatively dry

and warm at the time of spraying for early infection, the spot is easily controlled. But, if the weather be wet at this stage, and humid atmospheric conditions supervene, without a breeze to temper the humidity,

Plate 193- Shows two stages of the Rome Beauty blossom.

the power of infectivity is increased, and this adds to the orchardists' discomfiture. The leading fungicides in use are Bordeaux mixture and

lime sulphur, and these have been applied with varying results; but those obtained from the use of the former have, in the opinion of the writer been, on the whole, the more generally satisfactory. Owing mostly to the weather conditions which largely govern the growth of black spot it is difficult to determine year after year the correct time, or when the bloom is in the proper stage to receive the first spray. Various results may follow the application of a spray mixture used at the same strength in the same orchard during a series of years on blooms having arrived at a like stage of development. The irregularities in the results obtained, apart from the influence of the weather conditions prevailing at the time of spraying, are largely due to the number of ascospores present and the variation in the time of their liberation from the asci. It is evident that certain obscure influences retard, while others facilitate, the ripening of the spores, and it is reasonable to conclude that spraying should commence as soon as the ripe stage is reached.

Some of our apple-growers spray twice to cope with the early infection. Plate 193 shows two stages of the Rome Beauty blossom, and those applying Bordeaux mixture mostly use the 6-4-40 strength about the time the blossom is in the condition of Fig. 1, and a 6-4-50 spray when the Fig. 2 stage is reached, or a little later. The majority of growers, however, only spray once—at the time when the blossoms show pink, just before the petals begin to open, using, as a rule, the 6-4-50 strength. In order to obtain the best results from Bordeaux, it is essential that the mixture should be properly made. This is to insure, through using the proper proportions and by careful mixing to facilitate, the necessary chemical changes between the bluestone and the lime, the production of a fungicide which, while capable of destroying the spores of the fungus, will not injure either the foliage or the fruit. The 6-4-50 formula, which consists of 6 lbs. sulphate of copper (bluestone), 4 lbs. of calcium oxide (quicklime), and 50 gallons water, is now practically regarded as a standard, it being necessary only to reduce or increase the quantity of water to obtain a stronger or weaker mixture.

In preparing Bordeaux mixture in small orchards, three barrels—two of 25 gallons capacity each and one of 50 gallons—are required, but vessels for use in large plantations may be whatever size is necessary, but they should be of like proportions to each other. To prepare the mixture from the above formula, nearly fill one of the 25-gallon barrels with fresh water, then place the 6 lbs. of bluestone in an old sugar-bag, and suspend the same just below the surface. Bluestone is easily soluble in cold water, but it will dissolve much more rapidly if the water be first heated. Then slake 4 lbs. fresh lime in a bucket, applying the water slowly at first, and, when the solution is in a fit condition, carefully strain same off into the other 25-gallon barrel and add sufficient water to fill the container. When quite cool, both the bluestone and milk of lime solution, after each has been thoroughly stirred, should be poured evenly from two taps fixed near the bottoms of the barrels, through a strainer into the 50-gallon receptacle, or into the spraying vat. During this time, and while the spray is being applied to the trees, the mixture should be kept well agitated. Fortunately, since the introduction of motor spray pumps, which are fitted with powerful agitators, this condition of the mixture is easily maintained.

The spores, which are more easily destroyed during the germinating stage, mostly attack the upper surface of apple leaves. The spray may be applied with considerable force, and the operation should be continued until the tree is thoroughly drenched. Owing to the caustic nature of the Bordeaux, the ascospores on the leaves before spraying commenced are rendered harmless, the development of fusicladium is arrested, and the deposit, while effective, acts as a preventive against spores finding a lodgment on the leaves or on the fruit subsequently. In dealing with later visitations of this disease, which often occurs in comparatively wet seasons, the strength of the mixture may be reduced to, say, 6-4-80, or even weaker, when treating varieties whose fruits have tender rind. In fact, most growers, because of the tendency of the Bordeaux mixture to cause russeting of the Jonathan, use lime sulphur exclusively on this variety. The ferrocyanide test will enable the orchardist to determine whether the Bordeaux, when made ready for use, contains sufficient lime, and thus reduces the chances of injuring the young leaves and flower buds. To make the test, dissolve 1 oz. ferrocyanide of potassium in a little water, and keep same in a bottle; add a few drops of this to a small quantity of the mixture placed in a glass to be tested. Should brownish discolouration occur, then the mixture lacks sufficient lime, and milk of lime should be added until no discolouration is apparent.

(*To be continued.*)

POULTRY MANURE.

This manure is rich in plant food, and if properly dried and stored in old sacks or casks it is said to be worth about four times as much as farmyard manure, and where there are a number of fowls kept it forms a considerable item in their yield. Since the advent of the motor car, stable manure is becoming scarcer every year, and it behoves all who keep fowls to save the manure. It should always be methodically saved by the small poultry-keeper as well, for a little concentrated manure for special uses is a very handy thing to have about a garden. It should never be used fresh, owing to its burning tendency, and its value is about double when it has been allowed to dry in the air. Once dry, it is best stored in a barrel, mixing in a little soot as the barrel is being filled up, and if not wanted for immediate use, a covering of dry soil should be placed on top. The manure is always more potent when it is spread on the soil, and for that reason should be stored in a dry shed. Sometimes a slight smell is noticeable when the manure is stored loosely, but if equal parts of manure and dry soil are mixed together little or no smell is noticed. An excellent liquid manure can be made by mixing some of the contents of the barrel with an equal quantity of soot, putting it in a piece of sacking and soaking it in water for a few days. About an ounce of dry manure and an ounce of soot are usually sufficient for a gallon of water, but experiments should be made each for himself as to the suitable strength for the plants in question, starting with a weak solution, and strengthening it if it seems advisable in later applications, but the above proportions are suitable for the majority of vegetables.

—*Auckland Weekly News.*

I—RESULTS OF WHEAT VARIETY AND MANURIAL TRIALS, SEASON 1918-19.

The results of the Wheat Variety Tests and Manurial Trials at the Longerenong Agricultural College, and the tests conducted at Warracknabeal and in the new Mallee area during the 1918-19 season are now available.

1. Wheat Varieties at Longerenong.

Twelve varieties of wheat were tested in the half-acre plots, which were fertilized with superphosphate at the rate of 1 cwt. per acre. The rainfall for the year was 14.75 inches, of which 6 inches fell during the growing period of the crop.

The results were as follow:

YIELDS OF HALF-ACRE PLOTS.

	bush.	lbs.	
New Crossbred, Gallipoli	41	52	per acre.
Selection Federation	40	2	„ „
New Crossbred, Federation x Bobs	40	0	„ „
New Crossbred, Graham	38	31	„ „
Major	36	48	„ „
New Crossbred, Redilla	36	3	„ „
College Eclipse	35	21	„ „
Yandilla King	33	38	„ „
Minister	33	18	„ „
Dart's Imperial	32	24	„ „
Bunyip	30	52	„ „
Glencope (shed badly)	17	24	„ „

These results demonstrate that, by the liberal application of fertilizers on well-worked fallows, high yields of wheat may be obtained, even in a relatively dry season. Both the total rainfall and the rainfall during the growing period of the crop were much below the average. Despite this, however, yields of 40 bushels per acre were obtained.

The new crossbred wheats have given highly satisfactory results, particularly Gallipoli—a crossbred of Clubhead on Yandilla King—which gave 42 bushels per acre.

Selected Federation produced over 40 bushels per acre, showing that the yielding capacity of this justly popular variety may be maintained at a high level by selection.

The Longerenong College authorities sowed eight varieties of wheat on an area of 342 acres. From this area 4,140 bags were taken—an average of 36 bushels 13 lbs. per acre.

The returns from these bulk areas were as follow:—

	bush.	lbs.	
New Crossbred, Gallipoli	40	5	per acre.
Selected Federation	39	12	„ „
Major	36	18	„ „
New Crossbred, Graham	36	0	„ „
College Eclipse	34	6	„ „
Yandilla King	32	34	„ „
Dart's Imperial	32	36	„ „
Bunyip	28	4	„ „

The order of yield in the bulk areas was approximately the same as that from the experimental plots, showing that the latter are just as reliable in indicating the differences of yield of wheat varieties as the large areas, and that, consequently, there is no necessity to appeal to the large areas to secure accurate information.

The yields form a striking testimony to the fertility of the wheat-growing areas of the Wimmera when liberally fertilized and well worked.

2. Permanent Manurial Tests at Longerenong.

The design of the tests, of which duplicates exist at the Research Farm, Werribee; at the State Experimental Farm, Rutherglen; and at G. C. Coutts' farm, at Warracknabeal, enables accurate information to be secured of both the immediate and the ultimate effect on the yields of wheat of annual applications of a number of typical fertilizers.

The returns from each plot are partly the result of the soil itself, and partly the result of the manure applied; but the inclusion in the series of several plots to which no manure is applied enables the true effect of each fertilizer to be readily obtained.

It is, therefore, possible, by charging the cost of the manure applied against the value of the increased crop, to draw up a balance-sheet setting forth the net profit per acre resulting from the use of each manure.

The plots have now been maintained for six years, and the information already secured is of interest to wheat farmers, particularly to those situated on the black soils of the Wimmera.

The plots are sown with Federation wheat at the rate of 60 lbs. to the acre on well-prepared fallow.

In the following table are given the results obtained from the variously-treated plots for the 1918 season, as well as the average yield during the six years the plots have been in existence:—

Treatment.	Yield, 1918	Average Yield, 1913-1918
	bushels per acre.	bushels per acre.
No manure	34·8	26·0
Superphosphate, ½ cwt.	36·6	31·4
Superphosphate, 1 cwt.	41·6	32·5
Superphosphate, 2 cwt.	44·0	34·9
Superphosphate, 1 cwt.; and lime, 5 cwt.	42·0	31·8
Superphosphate, 1 cwt.; and lime, 10 cwt.	41·8	31·8
Superphosphate, 1 cwt.; and nitrate of soda, 40 lbs., with seed	42·3	31·3
Basic slag, 1 cwt.	37·6	28·3
Superphosphate, 1 cwt.; nitrate of soda, 40 lbs.; sulphate of potash, 40 lbs.	40·8	32·4
Superphosphate, ½ cwt.; basic slag, ½ cwt.	39·6	31·2
Superphosphate, 1 cwt.; nitrate of soda, 40 lbs., in spring	38·6	32·3
Farm yard manure, 10 tons	35·0	31·2

The results of the six years' test demonstrate the striking value on these soils of phosphatic manures of the water-soluble type. Superphosphate appears to stand alone.

No other manure, either by itself or in combination with superphosphate, has succeeded in producing as high an average return as superphosphate. Indeed, the whole of the manures other than phosphatic appear to have either no effect at all, or even to depress the yields somewhat.

The real test is, of course, the net profit per acre obtained in each case after deducting the cost of the manurial application.'

TABLE SHOWING NET PROFIT PER ACRE OBTAINED FROM HEAVY AND LIGHT DRESSINGS OF PHOSPHATIC MANURES.

Average Results for Six Years.

Treatment.	Yield per Acre.	Increase over No Manure Plot.	Value of Increase at 4s. per Bushel.	Cost of Manure per Acre.	Net Profit per Acre after deducting Cost of the Manure.
	bushels.	bushels.	s. d.	s. d.	s. d.
(1) No manure	26·0	..	..	..	..
(2) Basic slag, 1 cwt. ..	28·3	2·3	9 2½	5 0	4 2½
(3) Superphosphate, ½ cwt. ..	31·4	5·4	21 7	2 6	19 1
(4) Superphosphate, ¼ cwt.: basic slag, ¼ cwt. ..	31·2	5·2	20 9½	5 0	15 9½
(5) Superphosphate, 1 cwt. ..	32·5	6·5	26 0	5 0	21 0
(6) Superphosphate, 2 cwt. ..	34·9	8·9	35 7	10 0	25 7

The table illustrates the remarkable efficiency of the small dressings of superphosphate that are in general use in the Wimmera to-day. It shows that the application of the first ½ cwt. returned an average net profit of 19s. 1d. per acre, and, further, that for each additional ½ cwt., up to a total of 2 cwt., a net profit of approximately 2s. per acre was secured. Further, the results appear to indicate that even 2 cwt. of superphosphate may not be the maximum amount that may be profitably applied to well-worked fallow on the black soils of the Wimmera.

The figures can certainly be accepted as proving that the usual quantity, viz., 56 lbs., can with financial gain be increased, at any rate, up to at least 1 cwt. to the acre. In support of this quantity, corroborative evidence has been secured from Werribee, Rutherglen, and Warracknabeal.

It is interesting to note, in this connexion, that 342 acres of wheat grown in bulk at the Longerenong College Farm were dressed this year with 112 lbs. super. per acre, and, notwithstanding the dry season, an average yield of 36¼ bushels to the acre was obtained.

3. Permanent Manurial Trials at Warracknabeal.

During the past seven years a number of experimental plots have been conducted at Warracknabeal on the farm of Mr. George Coutts, and the average results closely approximate to those obtained at Longerenong.

Check plots, on which no manure was applied, are also provided, as is the case at the other centres, so that the usual balance-sheet, in which the net profit per acre per annum that has resulted as the direct effect of using each manure, and after deducting the cost of the application, is available.

The plots are sown each year on well-prepared fallow, with 60 lbs. of Federation wheat, and manures according to the following list:—

Results for 1918, and the Average, 1912-1918.

Treatment.	1918.	1912-18.
	bushels per acre.	Average Yield per acre.
(1) No manure	15·3	13·6
(2) ½ cwt. superphosphate	20·8	20·1
(3) 1 cwt. superphosphate	22·6	21·7
(4) 1½ cwt. superphosphate	24·8	22·8
(5) ½ cwt. superphosphate and ½ cwt. basic slag ..	21·9	21·5
(6) 1 cwt. basic slag	19·1	19·8
(7) 1 cwt. superphosphate, 10 cwt. lime	21·0	21·5
(8) 1 cwt. superphosphate, 40 lbs. nitrate of soda ..	22·0	20·7
(9) 1 cwt. superphosphate, 40 lbs. nitrate of soda, and 40 lbs. sulphate of potash	22·0	20·7

Here, as in the case of Longerenong, the striking response of the soils to phosphatic fertilizers, and to them alone, will be noticed. No combination of other manures with superphosphate has increased the yield; indeed, some have actually depressed it. Of the phosphatic manures the water soluble type, *i.e.*, superphosphate, stands unbeaten.

Steadily increasing yields resulted with each increase in the amount of superphosphate up to the highest amount tried, viz., 1½ cwt.

The attached balance-sheet shows whether it has been profitable to make these increases:—

Comparison of Net Profit per Acre obtained by the use of Light and Heavy Dressings of Phosphates.

Average Results for the Seven Years 1912-19.

Treatment.	Yield per Acre.	Increase over No Manure Plot.	Value of Increase at 4s. per Bushel.	Cost of Manure per Acre.	Net Profit per Acre after deducting Cost of the Manure.
	bushels.	bushels.	*s. d.*	*s. d.*	*s. d.*
No manure	13·6	..	..	..	..
1 cwt. basic slag	19·8	6·2	24 9½	5 0	19 9½
½ cwt. superphosphate ..	20·1	6·5	26 0	2 6	23 6
½ cwt. superphosphate; ½ cwt. basic slag	21·5	7·9	31 7	5 0	26 7
1 cwt. superphosphate ..	21·7	8·1	32 5	5 0	27 5
1½ cwt. superphosphate ..	22·8	9·2	36 9½	7 6	29 3½

The table demonstrates that an application of ½ cwt. of superphosphate per acre has resulted in a net profit of 23s. 6d. per acre per annum. The addition of another ½ cwt. resulted in an extra 3s. 11d.

being added to that profit, while a still further ½ cwt. led to anoth 1s. 10½d. per acre being received.

From these figures it can be readily deduced that, had the dressi of superphosphate usually supplied in the district, viz., 56 lbs., been i creased to 1½ cwt. for the period under discussion, for each 100 acres wheat an extra profit of £202 14s. 2d. would have been realized.

Taking into account these results, and those from other centres, t evidence in favour of increasing the usual amount of superphospha applied to wheat up to at least 1 cwt. to the acre is overwhelming.

4. Wheat Manurial Tests in the New Mallee Areas.

Manurial trials under the control of the Department of Agricultu have been in progress during the past three years at the farms of Messrs. W. H. Pickering, Ouyen; H. F. Hecht, Cowangie; and P. G. Stewart, M.L.A., Carwarp. These centres are reasonably typical of the area, and the results so far obtained demonstrate that the amount of superphosphate usually applied in the district may be profitably increased. The experiments, however, indicate that, unlike the Wimmera, where dressings of 1 cwt. and over of this manure have been found profitable, in the Mallee the maximum amount that can be profitably used is not more than 60 lbs., though a steady increase in yield has been maintained with increasing dressings up to 90 lbs.

At Cowangie and Carwarp the plots are sown on fallow land, while at Ouyen they are on stubble. Forty-five pounds per acre of Federation seed was used. So far, superphosphate in varying rates is the only manure that has been tried.

Hereunder are shown the average yields at the three centres for the 1918 season, as well as for the period 1916-18:—

Treatment.	Average Yield for Three Centres, 1918.	Average Yield for Three Centres, 1916-18.
	bushels per acre.	bushels per acre.
No manure	12·6	17·5
30 lbs. superphosphate	15·7	21·1
60 lbs. superphosphate	17·0	22·3
90 lbs. superphosphate	17·3	22·5

The following balance-sheet gives the net profit per acre resulting from each application of manure. In determining this profit, the cost of each application of manure is deducted from the value of the increased yield of wheat so produced.

HEAVY AND LIGHT DRESSINGS OF MANURE.

Treatment.	Yield per Acre.	Increase over No Manure Plot.	Value of Increase at 4s. per Bushel.	Cost of Manure per Acre.	Net Profit per Acre after deducting Cost of the Manure.
	bushels.	bushels.	*s. d.*	*s. d.*	*s. d.*
No manure	17·5	..	..	..	..
30 lbs. superphosphate ..	21·1	3·6	14 5	1 4	13 1
60 lbs. superphosphate ..	22·3	4·8	19 2	2 8	16 6
90 lbs. superphosphate ..	22·5	5·0	20 0	4 0	16 0

It is thus seen that, while the use of 30 lbs. of superphosphate has resulted, on this basis, in a net profit per acre of 13s. 1d. as a direct result of using the manure, a further dressing of 30 lbs. has given an additional net profit of 3s. 5d. In other words, the use of this extra quantity, besides paying for itself and inducing heavier feed as a residual effect on the stubbles, more than pays for the rent of the land on which the crop was grown.

THE FLAX INDUSTRY.

The 1918 flax crop purchased by the Commonwealth Flax Committee at the guaranteed price of £5 per ton for crop of specified standard, is now being delivered to the mills. The mills at Drouin are in full swing, while those at Dalmore and Buln Buln will very shortly be in operation. With regard to the 1919 crop, for which £6 per ton has been guaranteed by the Commonwealth Government for crop of standard quality, the Flax Committee is desirous of last year's area under flax being considerably increased, and will be glad to get into touch with farmers in suitable localities, either individually or through local unions and societies, with a view to the cultivation of this crop in their districts. The Flax Committee consists of Dr. Cameron, Director of Agriculture in Victoria (chairman); Mr. A. E. V. Richardson, Agricultural Superintendent; and Mr. J. E. Robilliard, of the Victorian Department of Agriculture; Mr. A. C. Downs, cordage manufacturer, Brunswick; and Mr. E. R. Morton, farmer, Drouin, who represents the interests of the growers on the Committee. The Committee is having the seed carefully selected for this year's sowing, and intending growers may rely on clean, first-quality seed being supplied. The price of the seed has been fixed at 12s. 6d. per bushel at mill or on rails, Drouin, and applications for seed requirements should be made to Mr. R. B. Ward, secretary to the Flax Committee, 51 Spring-street, Melbourne, who will supply any further information desired. Experience has proved that the best time for sowing flax is from the middle of April to the middle of May, though this may be varied somewhat according to the locality and situation, but early seeding is advisable in order to have the plants well established before the winter.

A sample of the fibre flax on view at the office of the Director of Agriculture furnishes ample evidence of the suitability of Moe Swamp for the production of flax. In the sheaf, the flax was appraised at £1 above the Commonwealth guaranteed price of £5. The sample is 4 feet high, showing beautiful fibre, is well seeded, and is free of weeds.

TESTS WITH FLAX VARIETIES.

STATE RESEARCH FARM, WERRIBEE.

By George S. Gordon, Field Officer, State Research Farm, Werribee.

Flax (Linum), the cultivation of which has been carried on in some of the older countries for centuries, is to-day one of the most important "dual purpose" crops. The fibre of the flax plant has a wide range of usefulness, supplying the raw material from which the finest linen, as well as strongest cordage, can be manufactured; while the seed —known as linseed—is one of the most concentrated and fattening of stock foods. Even when the oil is extracted from the seed, the residue, linseed cake, is still very valuable for cattle. Linseed oil has many uses, and supplies one of the chief ingredients of most of the paints for woodwork, &c.

Though attempts have at times been made to encourage the industry, the quantity of flax raised is very small. Unfortunately, little or no systematic endeavour has been made to produce a variety suited to our climatic and soil conditions, and the average sample of commercial flax seed obtainable is of a mixed and unreliable character.

The great war has helped to teach us the advisability, if not necessity, of encouraging new industries which will make us more independent of outside services, but it is essential that these industries should be established on a sound foundation. Just as improved varieties of wheat have proved to be one of the most, if not the most, economical method of increasing the wheat yield, and the greater sugar content of improved varieties of sugar beet has enabled us to successfully compete with cane sugar grown in the tropics, so improved varieties of flax will assist to place the flax industry on a sound basis.

Experiments with English Seed.

During the past two years, several varieties of flax have been grown with encouraging results at the Central Research Farm, Werribee, and, in view of the increasing interest which is being taken in fibre production, the following brief account of the tests will no doubt be of interest.

Experiments have been made with two varieties, the seed of which was kindly given to the Victorian Department of Agriculture by Mr. R. W. Peters, Director of the Queensland Acclimatisation Society at Lawnton, Queensland. For some years, Mr. Peters was engaged with Professor Bateson in plant breeding at the John Innes Horticultural Institute, in England, and the flax seed which he brought with him was the result of several years' scientific hybridizing and selection. These selections have been grown alongside "check" or control plots sown under similar conditions with flax seed obtained from reputable seedsmen

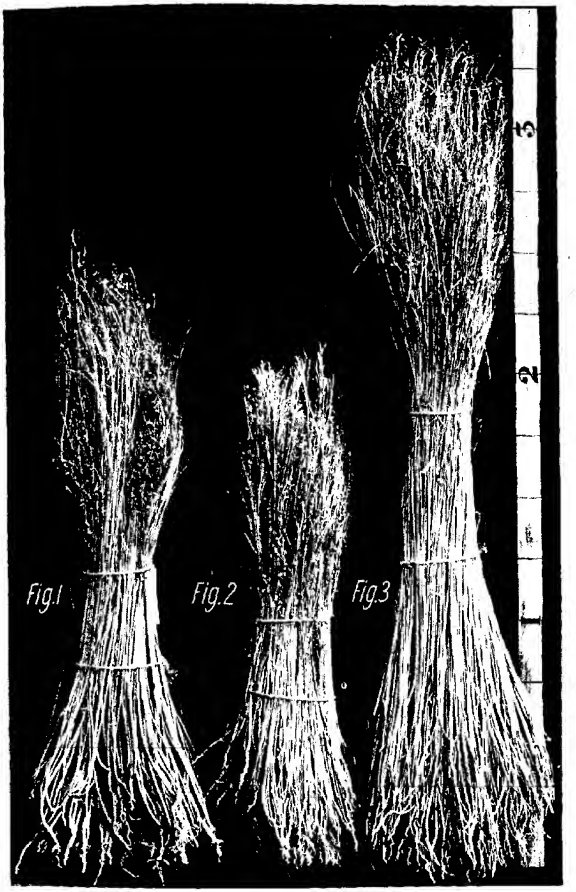


Plate No. I.

Fig. 1. Commercial Seed Flax. Fig. 2. Northern Linseed. Fig. 3. Selection from 20/4.

in Victoria. In 1917, the seed was sown in short stud rows, 4 links apart, and the results are shown in the following table:—

TABLE No. I.

Variety.	Height of Fibre.	Yield of Seed.	Remarks.
	inches	oz.	
1. Commercial seed flax (Selected for seed)	21	10	Plants very coarse and considerably branched
2. Northern linseed ..	18	11	Plants medium coarse and slightly branched. Quantity of seed much larger than that obtained from either of the other plots
3. Selection from 20/4 (Selection for fibre)	31	8	Plants fine and tall with little branching

De-seeded samples of the plants mentioned in the foregoing table are illustrated in Plate No. 1.

In 1918, seed from the plots of Northern Linseed and the Selection from 20 4, was sown on 31st July with another sample of seed obtained in Victoria as a check plot. The three varieties were sown through the seed-box of an ordinary 17 hoe, grain, and fertilizer drill, set at the lowest speed for wheat (22 lbs. per acre). Each plot was sown in two drills, 7 inches apart, and 5¾ chains long, with 28-in. spaces between the plots—the sowing being made on one sweep of the drill, and superphosphate distributed at the rate of 120 lbs. per acre, at the same time. A good germination was obtained, but the spring proved dry, and the plots were therefore irrigated on 24th October, and again on 20th November. The harvest results are recorded in the following table, and samples of the plants are shown in Plate No. 11.

TABLE No. 11.

FLAX PLOTS, 1918.

Variety.	Date of Sowing.	Date of Harvesting.	Height of Plant.	Yield of Seed.	Percentage of Oil.	Remarks.
			inches	lbs. ozs.		
1. Commercial seed flax	31.7.18	13.12.18	9	3 9	20·19	Crop too short for harvesting with binder or stripper
2. Northern linseed	..	26.12.18	18	15 4	19·66	Seeds large; stems fine, with some tillering or branching
3. Selection from 20/4	..	13.12.18	37	5 0	19·33	Stems fine, tall, and clean

With most crops, the choice of a variety that will yield the maximum amount of produce under conditions in which it is grown, is an important matter for consideration. Even with well-known varieties of wheat raised in Australia, the difference in yield is often sufficient to cover the rent of the land, and, in some cases, even means the difference between profit or loss on the crop. A flax-grower desiring a fibre variety, would be disappointed with a crop of the Northern Linseed type, and, conversely, one desiring a heavy yield of seed would be dissatisfied with the

return from the fibre selection known as 20/4; and they would be equally disgusted with the result from the commercial seed types. If a progressive farmer in a district where flax had not previously been grown, were to commence with seed of the latter type, he would not be likely to try the crop a second time, and flax growing would thus receive a serious set-back, if it were not absolutely damned, in that particular district.

Plate No. II.

1. Commercial Seed Flax. (3 lbs. 9 ozs.) 2. Northern Linseed. (15 lbs. 4 ozs.) 3. Selection from 20/4. (5 lbs.)

(The bags contain the total seed obtained from each particular plot, and indicate the relative yield from areas of equal size.)

Experiments with American Seed.

During his recent visit to America, Mr. A. E. V. Richardson, M.A., B.Sc., Superintendent of Agriculture, Victoria, obtained seed of several varieties of flax grown in the United States, and, although the spring was well advanced when the seed was received at Werribee, a small portion of each variety was sown. Some of these failed to germinate, and it should be remembered that those that did were summer-grown (with the aid of a liberal water supply), and that better results will probably be obtained when a sowing is made earlier in the year. These

varieties have not yet been thrashed, but available particulars are recorded in the table hereunder, and the produce is illustrated in Plate No. III.

TABLE No. III.

Variety.	Date Sown.	Date Harvested.	Average Height of Plants.	Remarks.
			inches	
1. Commercial seed flax	11.10.18	14.2.19	27	Check or control plot
2. Northern linseed ..	,,	,,	26	Queensland, grown at Werribee in 1917
3. Alberta .. .. (Canadian seed)	,,	,,	28	Canadian seed
4. Fibre flax "Blue Blossom" (From U.S. Dept. of Agric.)	..	,,	34	Selected in America for height and appears disease resistant

It is intended to test, during the coming, season, all of the above-mentioned varieties against the best types of Gippsland seed, and also to make an earlier sowing than last year of the varieties which failed to germinate then.

"Flax Wilt."

Flax, like most other plants, is subject to disease, the most destructive of which is known as Flax Wilt. This is a parasitic disease, which attacks the stem and cuts off the natural sap supply, thus causing the plants to wilt. As the disease has been observed for the first time in Victoria this year, it is interesting to note that some of the American varieties are said to have been selected for the reason that they were resistant to this particular disease.

Improvement by Selection.

The illustrations fairly indicate the great range of variation between the several varieties experimented with; and, while the differences in the coarseness, branching, or tillering of the stem may, to some extent, be influenced by the season, soil, and thickness of the crop, there was also an apparent variation in habit of growth "within" most of the varieties. The differences noticed at Werribee were in—

1. Height of plant and, therefore, length of fibre.
2. Yield and quality of stems for fibre production.
3. Habit of growth, tillering, or branching of stems, &c.
4. Yield of seed.
5. Size of seed.
6. Date of ripening.
7. Oil content of seed.

These variations indicate the possibility of improvement by selection, and advantage has been taken of the opportunity to select a few plants showing apparently improved characters. The seed from these will be grown in short stud rows this year, and thus possibly better strains may be isolated.

While the tests carried out at Werribee may be considered as preliminary ones, only touching the surface of the subject, they are

encouraging, and afford an example of an opportunity where—by extending the work—there appears to be a great possibility (if not probability) of science assisting the industry and increasing production. Work of this nature requires such patience, perseverance, keen observation, and attention to detail, besides entailing a large amount of work,

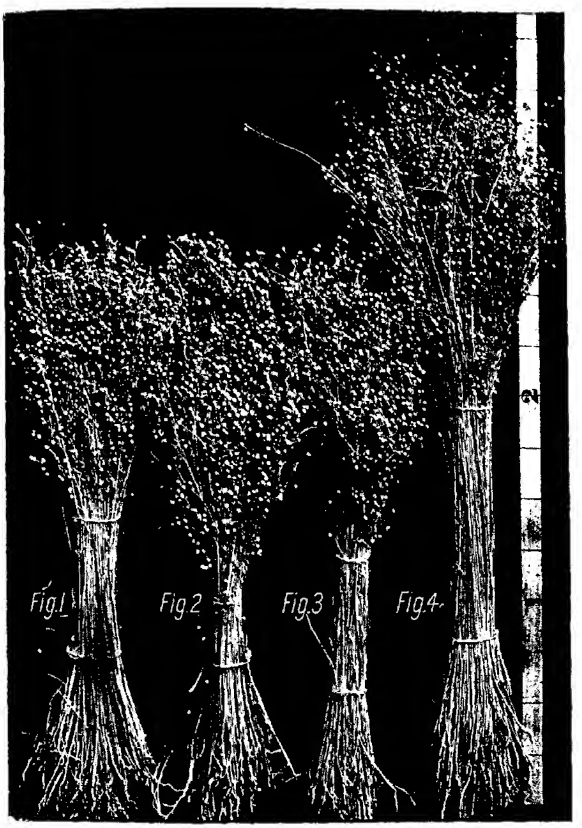


Plate No. III.

Fig. 1. Commercial Seed Flax. Fig. 2. Northern Linseed. Fig. 3. Alberta. Fig. 4. Blue Blossom.

that it is quite outside the scope of the average grower with the responsibility of making a commercial success of his farm; but it is hoped that the experiments at the Research Farm during the coming season will provide data that will be a guide to present and prospective growers.

Plate No. IV.

Fig. 1. Commercial Seed Flax, 1917. Fig. 2. Commercial Seed Flax, 191[illegible]
Fig. 3. Northern Linseed, 1918. Fig. 4. Selection from 20/4, 1918.
(Two representative plants of each variety.)

GREEN MANURIAL CROPS AND "TAKE ALL."

Ophiobolus graminis (Sacc.).

Charles C. Brittlebank, Plant Pathologist.

During the past season the disease "Take all" or "White-heads," *Ophiobolus graminis,* Sacc., has developed to a more or less serious extent in all the green manurial plots at the State Research Farm, Werribee.

For a number of years (1913-18) wheat has been used every alternate year in rotation with various green manurial crops. On one half of the plots the green crops have been ploughed in, and on the other half they have been fed off. In each series of plots one section is given up to bare fallow and wheat every other year. During 1918 the plots sown with wheat developed "Take all" badly.

An attempt has been made to ascertain the effect of the various green crops upon the percentage of disease present. It should, however, be clearly understood that the results obtained relate to one season only, and will possibly be far from the actual results when the investigations are carried over a series of years.

What is "Take all."

Some years ago there was some doubt as to the cause of "Take all," but this was cleared up by Mr. D. McAlpine in Bulletin No. 9, "Take all and white-heads in Wheat," issued by the Department of Agriculture, Victoria. In this Bulletin it is clearly shown that the cause is due to the fungus, *Ophiobolus graminis,* Sacc. Of all fungus diseases affecting wheat "Take all" is the most destructive, and the actual loss caused by it is far greater than by any other single disease, Rust included, or perhaps by a combination of all known fungus diseases affecting wheat in Victoria.

Rust when present in epidemic form causes more widespread loss for the one season, but fortunately it appears only once in a series of years, while "Take all" is always with us, destroying a few plants here, thousands there, and nearly the entire crop in other places.

Possible Conditions favouring "Take all."

As to conditions favorable to the disease or its control very little is known. In fact, it is not known whether the fungus favours an acid or an alkaline soil, or one rich in organic matter.

In regard to the alkalinity of the soil, some very suggestive facts have been recorded from the Permanent Test Plots, at the Research Farm, Werribee. These plots are twenty in number, and four of them have been dressed with lime in combination with other fertilizers every alternate year since 1913. In each and every plot where lime has been used "Take all" is present to a far greater extent than in any of the others. The manurial treatment of the four plots to which lime was

applied, as well as the percentage of "Take all" present, is shown in the following table:—

Plot.	Treatment.	Percentage of "Take all."
8A	Stable manure, 10 tons; lime, 10 cwt.	50
16A	Superphosphate, 1 cwt.; lime, 5 cwt.	48
17A	Superphosphate, 1 cwt.; lime, 10 cwt.	49
18A	Superphosphate, 1 cwt.; lime, 20 cwt.	49

It would appear, therefore, that an alkaline soil is favorable to the development of the disease, but it should perhaps be again remarked, this judgment is from one year's data only.

Now it is a well-known fact that if wheat follows wheat continuously, the time arrives when the yield does not equal in quantity the seed used. If, however, disease enters in as a factor, this result is attained in a far shorter time, despite careful cultivation.

Unfortunately, through a combination of factors, this stage has been reached in the experimental plots under notice, and at a period earlier than one would expect. Whether the condition will continue remains to be seen.

The following table shows the system of rotation followed in the green manurial plots and the percentage of disease observed in the various wheat crops grown during the 1918 season:—

Plot No.	Crop	Percentage of "Take all" during the 1918 Season.
11	Wheat after rape ploughed in	15
12	Wheat after barley ploughed in	60
13	Wheat after peas ploughed in	15
14	Wheat after rye and vetches ploughed in	25
15	Wheat after bare fallow	10
16	Wheat after rape fed off	12
17	Wheat after barley fed off	25
18	Wheat after peas fed off	10
19	Wheat after rye and vetches fed off	56
20	Wheat after bare fallow	15

In making a comparison between the plots on which the green crops were ploughed in and those where the crops were fed off, we find that on the average the "fed off" plots have a slightly less percentage of disease present. Further, these latter plots have yielded feed for stock, while the former have required the additional work of ploughing down the green crops. In other words, where the green crop was ploughed in there was more labour necessary, yet there was less grain and less feed; but where the crop was fed off, less labour gave a better result and, in addition, there was more feed for stock.

Individual Plots Compared.

Taking the bare fallow plots, one would at least expect that they would approach each other closely in the number of diseased plants present. Yet one (Plot 20) bore 15 per cent., while another (Plot 15) bore only 10 per cent. of diseased plants. The former plot appears to have been very wet in the early part of the season, and this may have, to some extent, rendered the plants more liable to attack.

Pease ploughed in (Plot 13) gave 15 per cent. "Take all," and pease fed off (Plot 18) 10 per cent. Where pease have been used the disease is less, and the crops better; in fact, the disease was less and the crops slightly better than on the bare fallows.

On the plot where rape was ploughed in (Plot 11), "Take all" equalled 15 per cent., and where rape was fed off (Plot 16) there was 12 per cent. "Take all." A considerable difference in the apparent bulk of the crops was noticeable, Plot 16 having, to all appearances, a far better yield. In my judgment, it was the best crop in the whole series.

Barley ploughed in (Plot 12) gave the highest record of disease of the whole lot, viz., 60 per cent. "Take all." Barley fed off (Plot 17) had 25 per cent. "Take all" present. Even the combined average for the two plots shows the highest record for "Take all" in the whole series. Barley has been recorded in Victoria as the host of *Ophiobolus graminis,* Sacc., and possibly the alternation of wheat and barley for the past six years has in great measure infected the soil. Where the whole plant has been ploughed under, the infection is highest, while, on the other hand, where the barley has been eaten down the disease was 35 per cent. less. Why this is so one cannot say with observations extending over one season only.

Where rye-vetches were ploughed in (Plot 14), "Take all" showed 25 per cent., and rye and vetches fed off (Plot 19), 56 per cent. These plots are not comparable on account of the variation in combination.

So far as one can gather from the one season's observations, pease, either fed off or ploughed in, seem to give the cleanest crop, so far as "Take all" is concerned. Bare fallow follows next in order; and, on the whole, I think that no better system of cultivation has yet been devised than wheat after good, well-worked, clean fallow. If the rotation be wheat alternating with fallow, it is better to burn the stubble of the previous crop. By doing so, a great many fungus diseases are partly killed out, especially "Flag smut," *Urocystis tritici* Koern and "Take all," *Ophiobolus graminis,* Sacc.

Hosts of "Take all."

The hosts upon which the "Take all" fungus has been recorded are—

1. Wheat *Triticum vulgare Vill.*
2. Oats *Avena sativa.* L.
3. Barley *Hordeum vulgare.* L.
4. Barley grass *Hordeum murinum.* L.
5. "Soft Brome" grass *Bromus mollis.* L.
6. "Spear grass" *Bromus sterilis.* L.
7. "Wheat grass" *Agropyron scabrum. Beauv.*

RAINFALL AT WERRIBEE.

Water-logging and drying out of the soil tends to the development of "Take all," and the weather conditions last season were such as to encourage its spread. The rainfall at the State Research Farm for 1918 was as follows:—

	Inches.
January	.50
February	.70
March	3.80
April	.74
May	2.12
June	1.69
July	1.82
August	2.90
September	2.21
October	2.10
November	.38
December	1.00
Total	19.96

It will therefore be seen that during the wheat-growing period the rainfall was favorable except during the month of November.

CORRECTION.

BOTTLING OF FRUIT.

In Miss Knight's article on the Bottling of Fruit for Home Use, published in the *Journal of Agriculture* for December last, in describing an old way of preserving fruit, a passage read (pages 724-5):—

> "The fruit should be . . . . packed into jars and each filled with cold syrup, and the lid put *tightly* on."

The use of the word "tightly" was due to a typographical error, and should have been printed *lightly*.

CLOSER SETTLEMENT STUDIES.

A Miniature Dairy Farm.

Robt. C. Lorimer, Dairy Supervisor.

From time to time details have been published showing that, with proper management, dairy farming is a profitable undertaking. Confirmation of this is afforded by the excellent results obtained by Mr. Ewen Wanliss, of Nanneela South, in the Rochester irrigation settlement, from his little Jersey herd of five cows. For the year ended 30th June last they gave a total return of £144—an average of £28 16s. per cow. This return represents the value of cream supplied to the Rochester Co-operative Butter Factory (paid for at the rate of 1s. 4d. per lb. of butter fat), plus the value of milk and butter used in the household. In the total of £144 mentioned nothing has been allowed for the value of pigs, partly reared on the surplus separator milk, nor for calves which for the first fortnight after their birth were fed on new milk, and then for another fortnight on half new and half skim milk, before being fed on separator milk alone.

When Mr. Wanliss settled at Nanneela it was his intention to engage in dairying on a big scale, but the failure of the water supply in 1914-15 compelled him to sell his cows, and since then he has devoted most of his energies to sheep, which have given very satisfactory results, with less labour and worry than cows would have entailed. However, he obtained a few pure Jerseys from Mr. Russell, of Langiwilli, near Skipton.

Although these cattle are pure-bred, unfortunately their pedigrees are not obtainable, owing to the death of the original owner, otherwise they would be tested under the "Government Herd Test," which Mr. Wanliss considers of inestimable value to the dairy farmer, and he only mates his cows with a bull from a tested cow. It is very unfortunate that many owners fail to register the pedigrees of their high-class pure stock, for a consequence is that the full value of the progeny may be lost to purchasers.

The bull in use at Langiwilli was Brighton Prince, by Brighton King (imp.), dam Starbright. Mr. Wanliss' bulls have all been selected from Mr. C. Gordon Lyon's Banyule herd, the one at present in use being King Parrot, by Mabel's Chief (imp.), from Parrakeet.

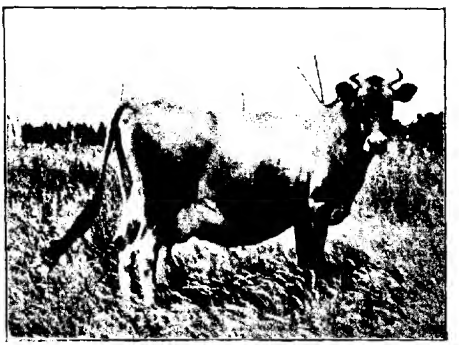
Parrakeet's record is as follows:—

Year.	Milk.	Test.	Butter Fat.	Days.	Milk last Day	Age.
	lbs.		lbs.		lbs.	
1915 ..	7,287	4·70	342.65	273	18	2 years, 1st calf
1916 ..	9,827	4·47	438.90	273	20	2nd calf
1917 ..	7,823	4·31	337.03	273	15	
1918 ..	8,656	3·88	335.81	273	18	

The results of a number of Mabel's Chief's heifers are very good, and some were given in the *Journal of Agriculture* for September, 1918, page 519, so that the progeny of Mr. Wanliss' cows by this bull should give satisfactory records.

Mr. Wanliss has not kept the individual records of his cows for the twelve months, but during the greater part of the year each cow's milk was weighed daily, and occasional tests made. The following is one

day's record:—Tulip, 43 lbs., 4.2 per cent. test, equals 1.8 lb. fat. Diamond, 29 lbs., 4.8 per cent. test, equals 1.39 lb. fat. Barrios, 35 lbs., 5.1 per cent. test, equals 1.78 lb. fat. Pearl, 42 lbs., 4.4 per cent. test, equals 1.84 lb. fat. Ruby (first calf heifer), 30 lbs. milk, 5.1 per cent. test, equals 1.53 lb. fat. The highest daily yield of milk from each cow was respectively, 65 lbs., 43 lbs., 45 lbs., 50 lbs., 34 lbs. Mr. Wanliss



"Pearl."

"Moonstone."

is keeping individual records during the present year, and when these particulars were obtained two heifers on first calf were giving the following results:—Emerald (under two years old), 31 lbs. milk, 6 per cent. test, equals 1.86 lb. fat; Topaz, 45 lbs., 4.3 per cent. test, equals 1.93, or nearly 2 lbs. a day. Although these cows have been carefully bred to produce heavy yields, their owner attributes the good returns mainly to careful management and feeding. Great attention is paid to regularity in milking, careful milking, and thorough stripping.

Mr. Wanliss is a firm believer in variety of feed for cows, and all the feed required is raised on the farm. The following crops grown in season have given the best results:—Oats, Japanese millet, lucerne, imphee. Oats and millet are grazed, and sometimes lucerne, but the last-named is generally made into hay. Imphee is regarded as a very valuable fodder, and is cut and carted out to cows. It is much relished by the stock, and has the advantage of being available in late summer and autumn, when there is usually a shortage of other feed. Here, as in many other places, lucerne is one of the best crops, and ensilage made from it has proved excellent, and is generally sought after by the cattle.

Like most farmers grazing stock on irrigated lucerne, Mr. Wanliss has to watch his cows closely for blowing, but has found that a dose of raw linseed oil will reduce the gas in a few minutes.

It has not been found necessary to rug or house the cows, as it has been noticed that when well fed, cold and rough weather has had very little effect on the yield of milk.

(Reading from left to right) **Ruby, Topaz, Barrios, Emerald, Moonstone.**

He has found the Jerseys very hardy, and they give a large yield right up to time of drying off. By keeping a daily record of the weight of milk, any decrease is at once observed, and cows changed to fresh feed. The keeping of daily records has thus been a means of maintaining the milk yield, and further has encouraged hired labour to do the milking more thoroughly.

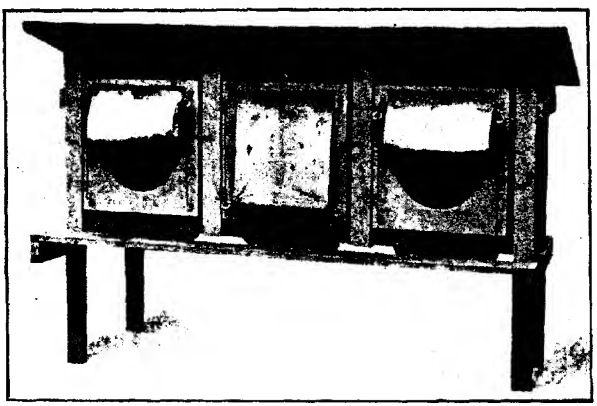
The farm is situated about 7 miles east of Rochester, and the land is typical of most of the northern irrigation districts—a red sandy loam of varying depths on a clay subsoil. Mr. Wanliss says that, with intelligent cultivation and irrigation, it can be made to grow almost anything. The prolific growth of the various fodder crops, fruit, and vegetables on the farm is ample evidence of this. Although devoting most of his attention to sheep, mainly owing to the difficulty of obtaining suitable labour, he believes that dairying, if carried on on right lines, is by far the most profitable industry, especially on small holdings, and he considers the northern districts, with irrigation, second to none in Victoria.

TRAP NESTING.

W. C. Ragg, Government Farm, Wyuna.

A poultry farmer breeding for prolific egg production cannot attain his object unless he knows exactly what return is being obtained from individual birds. Single penning is undoubtedly the most accurate method of finding this out, but the high cost of building material is a bar to a great many poultry breeders erecting the required number of pens.

The most economical way to ascertain the best layers in a flock is to trap-nest pullets for the first twelve months, and any birds not showing a satisfactory tally can then be culled out. By using trap-nests the breeder is enabled to identify the good layer, the bad layer, the hen that lays the tinted egg, the badly shaped egg, the thin-shelled egg,

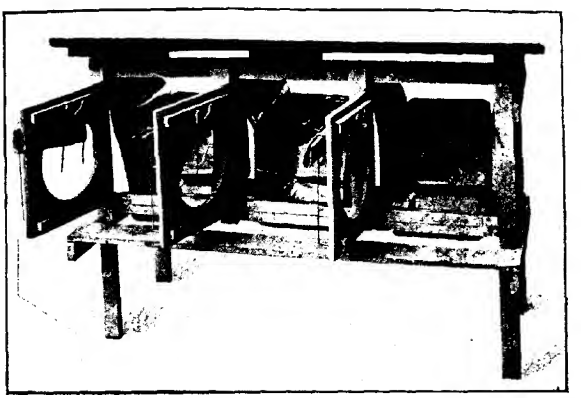


Set of Trap Nests.—Centre nest shows position of curtain when hen is on nest.

the small egg, or the double-yoke egg, and the hen that eats her egg. The illustrations on pages 178 and 179 show sets of trap-nests used for the egg-laying competitions at Burnley, and which can be recommended because they can be cheaply and easily made by any one handy with a hammer and saw. Such trap-nests have been in use at the Wyuna State Farm for the past four years, and have proved highly satisfactory. Sets of four nests are used for pens of 6 birds. If constructed as illustrated, plenty of ventilation is assured even on the hottest day, and the roof projecting a few inches protects the nests from the weather.

It is advisable to place the nests in the yards a week or two before the birds start laying. The blind should be hung up and the bob-wire sufficiently bent to allow the birds to go in and out; this will give them confidence. On the day of commencing the testing, bend wires back to original position and set trap in the ordinary way. Instances of pullets laying outside sometimes occur, but, if the offender be caught and placed in the nest once or twice, there is not likely to be any further

trouble. It has been found that every two hours is sufficient to visit the trap-nests, but it is advisable to place them in the yards in such a position that they can be readily seen by the attendant whilst engaged in his ordinary duties. These trap-nests are invaluable in the breeding pen for the identification of the eggs laid by previously tested hens. The egg can be marked with the hen's number at the time it is laid. It can be hatched separately and the chicken branded; if a cockerel, it will assuredly command a better price coming from a tested hen; if a pullet, it may be tested, and the result should be of value to the breeder in mating his birds during the following year.



Trap Nests—showing interior.

Material Required for Set of Four Trap-Nests.

2-in. x 1-in. Oregon.

4 pieces 4 ft. 10 in. long.
2 pieces 2 ft. 4 in. long.
2 pieces 2 ft. 1 in. long.
6 pieces 1 ft. 3 in. long.
2 pieces 1 ft. 4 in. long.
2 pieces 1 ft. 10 in. long.
5 pieces 1 ft. 1½ in. long.
3 pieces 1 ft. 11 in. long.

4-in. x ½-in. Rough Lining.

7 pieces 5 ft. 3 in. long.
1 piece of rubberoid 5 ft. 3 in. x 2 feet.
4 kerosene tins.
4 trap-nest fronts (Smith's patent).
4 pairs 1½-in. butt-hinges.

Method of Constructing.

Lay two pieces of the 4-ft. 10-in. on bench 15 inches apart, nail on two pieces of 2-ft. 1-in., one at each end, then nail on three of the 1-ft. 3-in. pieces at equal distances, as in Fig. I.; this will form the

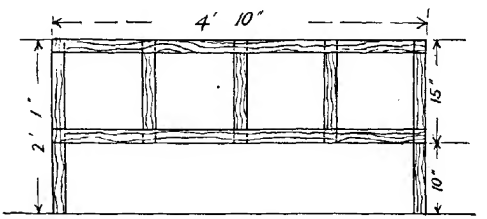


FIG. I BACK

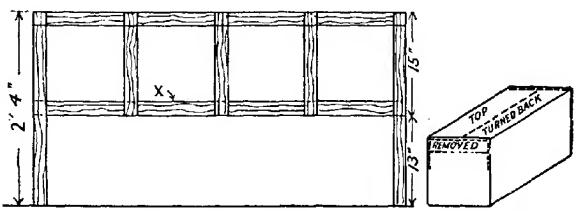


FIG 2 FRONT

KERO. TIN
FIG 4

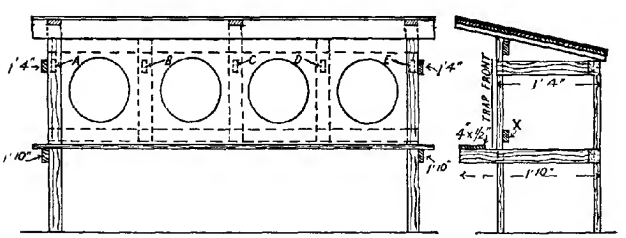


FIG 3 ELEVATION

SECTION

Plan of a set of four trap-nests.

back. Lay the other two pieces of 4-ft. 10-in on bench 15 inches apart, nail on the two pieces of 2-ft. 4-in., one at each end, and nail on the other three pieces of 1-ft. 3-in. at equal distances, as in Fig. II.; this will form the front. Take the two pieces of 1-ft. 4-in and nail on to

back at the top and on to the front 3 inches from the top; then nail on the two pieces of 1-ft. 10-in., allowing 6 inches to project in front to carry the step (Fig. III.). Then nail on the five pieces of 1-ft. 1½-in. at equal distances, as shown in Fig. III., A, B, C. D. E. To these pieces the kerosene tins, which will form the nests, will be nailed. Cut kerosene tins along dotted lines (Fig. IV.). Remove the small piece at the end dotted round, and cut down 2 inches on each side where indicated by dotted lines. Then cut right down dotted line along top and bend upwards; fit tins into frame and tack sides on to A, B, C, D, E, Fig. III. The piece of tin which has been cut down 2 inches in the front should be bent over the piece of timber marked X in Fig. III. and tacked down. Fix on trap-nest fronts with hinges. Then take six pieces of 4-in. x ½-in. rough lining 5 ft. 3 in. long and nail together with the three pieces of 2-in. x 1-in. 1 ft. 11 in. long; nail this on to nest frame, and cover with ruberoid or other waterproof covering; this roof overlapping gives protection from the weather. The remaining piece of 5-ft. 3-in. lining is for the step.

MARKETING EGGS.

A. V. D. Rintoul. Assistant Poultry Expert.

The mid-February prices for eggs, fixed by the selling agencies in Melbourne, were from 10d. per dozen "ordinary" lots, up to 1s. 3d. for suburban new laid, the market report being as follows:—

Eggs.—Guaranteed lines of hen eggs are in keen demand and light supply. Ordinary lots are offered freely, and meet with a poor reception. Ordinary are quoted at 10d. to 11d., private lots 1s. to 1s. 1d., and new-laid 1s. 2d. to 1s. 3d. Duck eggs are worth from 10d. to 1s. 1d., according to quality.—(*Argus*, 14th February, 1919.)

It will be seen from the above that whereas there is a short supply and a keen demand for eggs—fit to eat—at 1s. 3d., what are termed "ordinary lots" only met "with a poor reception," and were "offered freely" at 10d.

The "ordinary" egg, therefore, as at present consigned to Melbourne is not in its best condition, and some explanation of the circumstances and suggestions for remedy are obviously necessary.

At the present prices of feed-stuffs, 10d. per dozen is not sufficient to pay for the food consumed by all the birds on the farm, and, therefore, allows no margin at all for other expenses, or profit. Whilst the suburban poultry-farmers have their own negligence to thank for the barely payable price of 1s. 3d. (they could quickly remedy the present "market" if they took the obvious course), the up-country farmers are actually losing money.

In hot weather, eggs should be collected twice a day, and kept in a cool place until marketed, which should take place twice a week. At present many are satisfied to gather them occasionally, not always troubling to even hand them over to the storekeeper each time his cart calls. He, in his turn, does not bustle himself to hurry the eggs off to the market, but allows them to accumulate till he has a consignment "worth while" sending to town. As a result, these country eggs arrive in Melbourne often two to three weeks old, and at times are dear enough even at the miserable price they bring.

It is occasionally stated with pride that the poultry industry of Victoria is worth over £2,000,000 a year to the State. Seeing that there are 4,000,000 birds in the State, it should be a source of shame to admit that, in spite of the various world's records that are put up by Victorian birds, *the average production is only* 10*s. a bird.* Proper care in marketing and a radical alteration of the present "market" should mean 50 per cent. better returns—another £1,000,000 to the State. For the benefit of the country districts, the following recommendations are made:—

Eggs should be marketed unfertile. Roosters are only useful to fertilize eggs for hatching, they do not increase egg-production, and should be removed immediately after the breeding season.

An abundance of clear, cool drinking water should be available for the layers—the egg is two-thirds water, therefore a supply of water is essential. Where water is scarce, renew the supply, however small, several times a day in warm weather.

The water should always be kept in the shade.

Water too dirty for the birds will still help to grow a little green feed.

Nests should always be kept clean, for if they are dirty and verminous the birds will lay elsewhere, and some eggs are sure to be lost.

Collect eggs twice a day in the warm weather.

Store the eggs in a cool place prior to despatch.

Pack eggs for market in odourless cardboard fillers. Musty chaff does not improve the flavour, so add only clean fresh chaff.

Always market twice a week.

Keep the small eggs for domestic consumption; evenly-graded eggs always command the best price.

Get the cases to the station half-an-hour before the train is due to start, otherwise they may be too late, and miss the market.

A satisfied customer is the best advertisement.

THE AUSTRALIAN FLORA FROM AN ORNAMENTAL ASPECT.

Edward E. Pescott, F.L.S., F.R.H.S., Government Pomologist.

Introduction.

The urgency of tree and shrub planting is becoming more and more apparent, especially in the areas away from the cities and towns, where for years the æsthetic aspect of farm and country life has been much neglected. The necessity for tree planting was previously urged in this *Journal*,* and there is no need here to cover that ground again; it is too well known.

No doubt there are many trees and shrubs suitable for culture in all climates and soils, plants of diverse foliage and general character, so that the choice for the intending grower is practically unlimited. But it must be agreed that the natural flora of any country is the one most suited to the natural conditions of that country; that is, conditions under which little or no artificial means of culture, such as abundance of water and manure, are available.

Very considerable prominence is now being given to the cultivation of the Australian endemic flora, and it is to encourage this patriotic sentiment that the following notes have been compiled.

It has been repeatedly stated that the character and colouring of the native trees are very monotonous. Such a statement could be made only by one who has not looked at them with a seeing eye. The gums are wonderfully variable in colouration—of greens, dark and light, of blue-greens, and of browns—and when the young growth comes, the purple, pink, and red colourings of the tips are magnificent. Indeed, the variations of colour that are apparent in the native flora form one of its great charms.

Our gum trees are universally known, and it is probably true that they are more appreciated by many people living in foreign countries than by Australians.

Gum Trees.

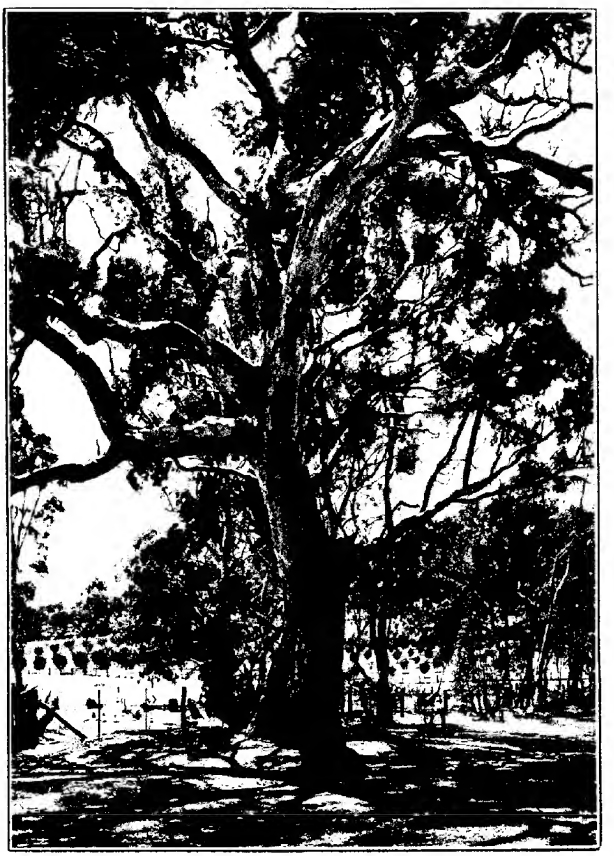
The eucalypts, or gum trees, as they are more familiarly known, form the chief Australian tree flora, and it has been computed that there are over 200 species, ranging in height from low shrubby trees to giant forest trees, perhaps the tallest trees in the world.

Gum trees for cultural purposes may be placed in two classes—those grown purely for their floral beauty, and those which are classed as ornamental trees.

Of those grown for the beauty of their blossom, the most popular and also the most beautiful is the scarlet-flowered gum of Western Australia, *Eucalyptus ficifolia*. This is generally considered to be a small tree, of low-growing habit, but occasionally fine large specimens are found in favorable situations. One of these is to be seen at Narre Warren, in Victoria, in the garden of Mr. G. W. Robinson. This tree, which is considerably over fifty years old, has three main stems, each averaging over 5 feet in circumference, while the trunk itself measures nearly

* "A Plea for Tree Planting and Tree Preservation," by J. M. Reid, I.S.O., Surveyor-General. *Journal of Agriculture*, Victoria, Vol. 4, page 705, Dec., 1906.

14 feet in circumference. The spread of the boughs is over 50 feet, and the height of the tree over 30 feet. To see a tree like this, in full bloom, covered with its masses of rich scarlet flowers, is a sight never to be forgotten. The typical colour of *Eucalyptus ficifolia* is scarlet; but, as a result of cultivation and hybridization, it is now found in



Red Gum—*Eucalyptus rostrata.*

shades of pink, crimson, scarlet, and orange. The flowers, being carried in big trusses, the stems brightly coloured, and the leaves large and shiny, the tree presents a very gorgeous spectacle during the blossoming season.

Another flowering gum very like this one is *Eucalyptus calophylla*, the red flowering gum of West Australia. This has a more upright

growth than the former, which is more spreading in habit. *Calophylla* normally has large trusses of fine, white flowers; but its variety *Rosea*, with its canopy of bright rose pink flowers, is a wonderful sight in summer. These two gums, as is the case with most species, are resentful of the use of stable manure, unless it is very old and well rotted. Even then, the application should be a light one. If it be necessary to hasten on the growth of Eucalypts, cow manure is by far the best of animal manures, while bonedust is useful among prepared fertilizers. Leaf mould, or some new soil, is always helpful.

Some of these flowering gums are very susceptible to attacks of frost when young. As they become three or four years old, the whole growth seems to become indurated or hardened. Consequently, in a cold or frosty locality, it would be well to shield the young plants with hessian or similar material in winter, and especially during frosty weather.

Eucalyptus leucoxylon rosea, the rose-flowered yellow gum, is a well-known flowering gum, which blossoms well in the winter time. The tree is tall and pyramidal, and very shapely, while the blossoms come in great profusion. The normal type of this "ironbark" has white flowers, but the rose-flowered form usually has blooms of a deep rose pink, and sometimes of shades varying from pale rose to deep crimson. This tree is being successfully grown as a street tree in many localities.

Eucalyptus sideroxylon pallens, the red ironbark, has pale pink flowers, and very pale glaucous leaves.

Eucalyptus erythonema (*conoidea*), the Mount Lindsay gum, is a fine, deep red flowering species, but the habit of the tree is rather sparse and weak. Perhaps if pruned and trimmed it may assume a more attractive form.

The same may be said of *Eucalyptus torquata*, the Coolgardie white gum, which has beautiful deep crimson blossoms, the buds and seed vessels being queerly corrugated.

Eucalyptus phoenicea, the fiery gum, is a small-sized tree, with long and narrow foliage. The flowers are carried in a dense truss, are fairly large, with orange or scarlet stamens.

In Brown's *Forest Flora of South Australia*, a fine coloured illustration is given of *Eucalyptus Lansdowneana*, a deep red-flowered and rather dwarf tree, growing in that State. So far, it has not been noticed in cultivation; but it appears to be a very decorative species.

Four species of Eucalypts possess fine, large, individual flowers, all of good colour. In each of them, the blossom is a couple of inches across. The most notable one is *Eucalyptus macrocarpa*, the large-fruited gum. It is a shrubby species, of which the stems and the large thick leaves are covered all over with a whitish mealy vestiture. The large, bright crimson flowers are very striking, and the whole plant is exceedingly handsome. Coming from West Australia, as, indeed, do most of our showy Eucalypts, it would require a warm and dry situation, if planted in the cooler climates of the Commonwealth.

Eucalyptus pyriformis, the Ooldea Mallee, has a large flower, and the fruit or seed vessel is even larger than that of *macrocarpa*. Here, again, is a shrubby species with rich yellow or crimson flowers, carried two or three together. The leaves of *pyriformis* are bright green.

Eucalyptus miniata, the vermillion-flowered gum, grows to be a tall tree, with pale-green foliage. The seed vessels are large and urn shaped, while the flowers are usually of a rich orange colour, and several grow together, forming a large cluster.

Willow Gum—*Eucalyptus saligna.*

Eucalyptus tetraptera, the four-wing fruited gum, has queer elongated four-sided seed vessels, with large, solitary red-stamened flowers. This is a shrubby species from West Australia, having thick green leaves. *Eucalyptus ptychocarpa*, the eight-rib fruited gum, also a large-flowered and large-fruited form from North Australia, has

rich scarlet flowers. The seed vessels of this species have six or eight prominent ridges on the sides. This is a rare plant.

Eucalyptus erythrocorys, the red cap gum, is a very striking and unique species. It is a tall, shrubby tree, with long green leaves. The flower buds are nearly 1 inch across, and the cap, which acts as the protecting lid to the bud, and which is known as the operculum, is rich scarlet in colour, with two ridged lines, forming a cross, on the surface. When the operculum is forced off by the expanding flower, this latter appears in a very deep yellow colour. There are frequently two or three flowers in a cluster. Another yellow-flowered species is *Eucalyptus Pressiana.* Again, this is a shrubby form, with broad, short, green or greyish-green foliage. The filaments of the flower are a pure rich yellow. The blooms are borne in clusters of two or three, and, like those of *erythrocorys,* are fairly large.

Eucalyptus Lehmanni, Lehmann's gum, is an interesting species, and one fairly well known. It is a low tree, with clustered greenish-yellow flowers, a single cluster often being as large as one's clenched fist. The five to eight buds are large, grow close together, and point out in different directions, each one being about half the size of a little finger, and an inch long. When the flowers are ready to expand, the filaments force off the cap, which is somewhat like a long thimble.

Eucalyptus cornuta, the "Yate" tree of West Australia, has clustered buds and blossoms very like *Lehmanni,* but much smaller. Sometimes the flowers are white, and at other times a rich yellow.

One of the finest white-flowered species is *Eucalyptus cosmophylla,* the handsome leaf gum, which is common on the Mount Lofty Range, near Adelaide. Its white flowers are conspicuous and abundant in April-May, and the foliage, as its specific name suggests, is very beautiful. This species is only of shrubby height, and it flowers when quite young.

(To be continued.)

PLANTING AND RECONSTITUTION OF VINEYARDS.

Conditions Governing the Distribution of Phylloxera-Resistant Vine Rootlings and Cuttings.

The conditions subject to which Victorian vine-growers may purchase phylloxera-resistant vine cuttings and rootlings (grafted or ungrafted) have been drawn up for the current year, and copies of same will shortly be available on application.

Beyond the necessary alterations of dates (substitution of 1919 for 1918, &c.), the conditions are much the same as for last season. There is no alteration in price.

The time within which applications will be received remains as it was last year, as will be seen below. Applicants are required to finally decide, when filling in their application forms, as to their stock and scion requirements; no amendment can be permitted later.

It will suffice here to explain that resistant vines are supplied to intending planters in any of the following forms, and at the prices stated; packing extra in the case of consignments forwarded by rail:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £6.

Resistant rootlings, ungrafted, at per 1,000, £1 10s.

Resistant cuttings, at per 1,000, 15s.

Application Forms.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Principal, Viticultural College, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings (*b*) Ungrafted Rootlings and Cuttings. Applications must be filled in on the proper forms.

Each applicant for forms will be supplied with a copy of the detailed conditions governing the distribution of phylloxera-resistant vine rootlings and cuttings.

Applicants are earnestly requested to thoroughly familiarize themselves with these. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed therein, nor can any request for special consideration be entertained.*

Dates before which Applications must be made.

For Grafted Rootlings (1920 distribution, June to August inclusive), applications will be received until 30th June next. (For the 1919 distribution the time for receiving applications closed on 30th June, 1918, and present applicants cannot be supplied until 1920.)

For Ungrafted Rootlings, to be distributed from July to August inclusive, 1919, applications will be received until 31st July, 1919.

For Cuttings (see conditions), applications will be received until 30th June, 1919.

Supplying Clean Districts.

The nurseries in which grafted rootlings are raised being situated in phylloxerated districts, these cannot be supplied to growers in clean districts. To do so would be manifestly unfair to owners of existing vineyards in such districts.

A limited number of clean resistant cuttings are, however, available, and these can be supplied to applicants from clean districts.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Green Manures.

If a cover crop of leguminous plants is required for green manuring a start at planting may now be made. This can be done only when all the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make a good growth before the winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will adequately cover the surface before winter.

Cultivation.

Should the weather remain hot and dry it will be very necessary to give the land surface a good stirring, so as to conserve water supplies. Where fruit crops have been gathered a start may be made late in the month with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

Pests.

No codlin moth-affected or diseased fruit of any kind should be left on the ground after the crop has been gathered. These should all be destroyed by boiling.

All rust-affected foliage and fruit of plum and peach trees, as well as all other stone fruits that have been attacked by this and other fungus diseases, such as shot-hole, &c., should be burned if possible. This will minimize the possibility of future attacks.

Vegetable Garden.

Autumn weeds must be kept out of the kitchen garden. These rapidly grow, and remain as robbers right through until the spring time.

The section should be well dug over for planting winter crops. Before digging a light sprinkling of bonedust and a good top dressing of stable manure should be spread on the surface. These may then be dug in, as they provide humus for the soil. Large plots should be avoided in winter; where such occur a path should be run down the centre. This will provide more efficient drainage. The beds, too, may be more raised than in the summer time.

Early onions may be planted out in the beds, and, if not already done, onion seed should be planted at once.

All classes of seedlings may be planted out, and seeds of lettuce, early peas, beet, carrots, radish, cabbage, cauliflower, and swede turnip may be sown.

Asparagus beds should be cleaned up and cut down as soon as the berries begin to colour. Celery rows should be kept earthed up; rhubarb beds should be given a dressing of manure to encourage the coming winter crop, and new rhubarb plantations may now be established.

Flower Garden.

All classes of spring-flowering bulbs may now be planted. In bulb planting the bulbs should not come in contact with any manure. The manure should, some time previously, have been dug well in, and mixed with the soil, and all heat should have disappeared. If manure is required it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy a little sand may be added to advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper.

The increasing prevalence of both bulb mite and rhizoctinia fungus in attacking bulbs makes it a matter of urgency that all bulb gardens and plots should be well dressed with lime before the bulbs are planted. The lime should be dug into the soil; and after the bulbs have been planted, a top-dressing should also be given. Each dressing need not exceed 2 ozs. per square yard.

Dahlias and chrysanthemums may be fed with liquid manure, or mulched with stable or poultry manure. In any case the feeding should not be too strong nor too frequent, and it should always be withheld before the flowers come.

All hardy annual, biennial, and perennial seeds may now be planted. Among these are dianthus, candytuft, sweet peas, Iceland poppies, anemone, ranunculus, stock, wallflower, columbine, foxglove, phlox, penstemon, pansy, gaillardia, &c.

Wherever aphis and red spider occur the plants should be sprayed with benzole emulsion, nicotine, pestend, or soaperine, or some other preventive in order to protect the coming flowers. Mildew attacks on the rose should be warded off by the use of sulphur. The sulphur may be either dusted on the plant or it may be scattered on the ground around and under the plant.

March is one of the best months for transplanting evergreen plants of all classes, trees, shrubs, and palms. The roots of the transplanted plants should be disturbed as little as possible, while the roots of those transplanted from pots should be well uncoiled and set out before planting.

The soil is now warm, and the roots will quickly take hold and grow. They are thus established for the winter, and will give little or no trouble in the subsequent summer heat and dryness.

In preparing the soil for planting the trees care should be taken not to dig small holes. A small hole is simply a "pot hole," in which the winter water accumulates, and as a result the young tree roots are rotted.

A large hole should be dug; or better still, the whole planting area should be well cultivated all over, and the plants or trees then set out in this cultivated area.

REMINDERS FOR APRIL.

LIVE STOCK.

Horses.—Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season. Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. Their mouths and feet should be examined and attended to where necessary.

Cattle.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. It will be found profitable to give a few pounds of bran, crushed oats or pollymeal in addition to other feed, to all cows giving a fair quantity of milk. Read article by Mr. B. A. Barr, "Food Values and Rations," in *Journal* for September, 1916. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows or those required for city milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter, give the best returns for the season, and be dry when the feed is dry and at its worst. Calves should have lucerne hay or crushed oats when grass is not plentiful. Take care that salt lick previously recommended is available. One or two pounds of linseed cake or meal given daily should be found beneficial. In addition to its feed value, the oil in the cake or meal will counteract the effect of dry feed, which is liable to cause impaction.

Pigs.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape, barley (especially skinless), oats, &c., may be sown for grazing during winter.

Sheep.—Merino and fine cross ewes, if mated early, will lamb from now on. Those in lamb to the larger British breeds of rams can be expected to give a certain amount of trouble in lambing.

Close attention should be given morning and evening to save every lamb possible, and any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching for fly, at the same time clear wool from around teats, and away from the eyes also. If the ewes are attentive mothers any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that are dull in appearance. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out with ½ oz. Lysol to 3 pints warm water. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

Poultry.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Add to drinking water one packet of Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit, shell, and charcoal should always be available.

CULTIVATION.

FARM.—Dig potatoes as they mature. Cart out and spread stable manure. Finish preparation of land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—1½ bushels, Oats; ½ bushel, Cape Barley; ½ bushel, Tick Beans; ½ bushel, Pease. Sow Giant Drumhead Cabbage for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, or Peruvian seed, free from dodder, in drills 7 inches apart and at the rate of 12-16 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

ORCHARD.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from trees as soon as all fruit is gathered.

FLOWER GARDEN.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs.

VEGETABLE GARDEN.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean out asparagus beds wherever the seeds are ripening.

VINEYARD.—Examine "Yema" grafts to see if strings require cutting. Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of Vinegar Flies (*Drosophila funebris*). If present destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors, &c.

TO SAVE TOMATO SEEDS.

It is not difficult, says an expert, to save tomato seeds. Select well grown, perfectly ripe tomatoes of the type desired from the most hardy productive plants in the bed. Be sure upon hardiness and cropping, because those features are likely to be transmitted. When the tomatoes are fully ripe, from day to day gather tomatoes of good shape from the selected plants, and do not be tempted to gather any odd fine fruit from plants which do not fulfil the conditions mentioned. Place the tomatoes on a tray or shallow box in the shade, and allow them to become soft. In fact, they may start to decay, but do not let them go rotten. If they are in the shade, they will probably dry without rotting, and some people adopt this method for their supply of seed. It is advisable, when the tomatoes are soft, to cut them and squeeze out the pulp into water, wash away all the pulp, and then strain the seed on to muslin, cheesecloth, or similar material, and put it in the shade to dry. When dry, place the seeds in a small tin, label it, and keep them ready for sowing at the proper time. When the seeds dry in the tomato they stick together and are not so easy to handle. Otherwise they are as good as those which are washed. If the washing, however, is done as described, the seed is not in any way injured. A good plan for washing is to use a small sieve, or to put the pulp in cheesecloth and wash the pulp through the mesh, leaving the seeds alone inside. The removal of the skin and hard parts first facilities the cleaning.